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Volume 43

August 1977 through
July 1978

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19-21 Izaak Walton League of America, Inc., French Lick, Ind.
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30-Aug. 2 Soil Conservation Society of America, Denver, Colo.

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- 6-9 American Agricultural Economics Association, Blacksburg, Va.
13-16 Conservation Education Association, Logan, Utah
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14-18 First International Rangeland Congress, Denver, Colo.
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Project **CLEARWATER**

August **19**

Mark August 19 on your calendar. That's the day for Project Clearwater, when more than 500 volunteers will reshape a worn-out 245-acre farm in Frederick County, Md., into a model of soil and water conservation.

Project Clearwater is being sponsored by the Catocin and Frederick Soil Conservation Districts to show that soil conservation also improves water quality.



Soil Conservation

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U.S. Department of Agriculture

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Districts Make Conservation Work

From the Administrator

The acknowledged leader of America's soil conservation movement at the local level is the soil and water conservation district. The first was formed 40 years ago this month.

Today there are over 2,950 of these local districts operating in all 50 States, Puerto Rico, and the Virgin Islands. Under one name or another, they were created under district laws passed in each of our States—a remarkable achievement in itself.

Each is responsible for the conservation work within its boundaries. Together the districts practically cover the Nation.

Each district has signed a Memorandum of Understanding with the Secretary of Agriculture, spelling out the responsibilities of each party. Typically, the district agrees to set local priorities for soil and water conservation and erosion control and to make sure that its cooperative agreements with land users are carried out.

The Department of Agriculture pledges to cooperate with and assist the district in this work, through its various agencies. This means that Soil Conservation Service technical people work through the district, not around it.

There are many advantages to this arrangement. First, local people are more apt to respond to conservation guidelines and goals set by friends and neighbors than to the recommendations of a Federal Agency.

Second, district people are attuned to local customs and the state of the economy. They know how—and when—voluntary programs work best.

Third, they provide and secure non-Federal financial support for conservation.

Fourth, they help USDA employees to relate their knowledge and skills to local conditions. District governing boards know what is realistic and attainable.

In a nation as large as ours, with a diversity of climates and soil and water resources, it would have been impossible to write a single prescription for soil and water conservation. To work, the national conservation program had to have a local base, and the district provided the answer. And it is still the answer.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

Farmers and ranchers use windbreaks to reduce soil blowing, conserve moisture, control snow, and protect crops. Windbreaks in five Great Plains States will be counted by aerial photography. See pages 6 and 7.

Soil Conservation

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How It All Began

Forty years ago this month, history was made. North Carolina landowners, interested in fighting erosion, established the Nation's first soil conservation district.

by Frank H. Jeter, Jr.

When 30 Anson County, N.C., landowners started circulating a petition to try to improve their own and neighboring land in the late 1930's, they had no thought of making history. They were simply interested in fighting the erosion plaguing farmland in North Carolina's Southern Piedmont.

The petition's sponsors sought support for establishing a conservation district, defining its boundaries, and holding a referendum of landowners to determine their sentiments about the matter.

Upon completion, the petition was mailed to the State Soil Conservation Committee, itself recently established by the 1937 North Carolina General Assembly following passage of the State's Soil Conservation Districts Law.

The committee, after examining the petition, approved a referendum. The election left no doubts about how interested Anson County farmers were in improved erosion control. By a lopsided margin of 300 to 1, the establishment of the district was approved. An enterprising reporter for the Charlotte *Observer* sought out the lone

It was 1937 when Hugh Hammond Bennett, first Chief of the Soil Conservation Service, visited North Carolina to help local farmers make plans for developing the country's first conservation district.



farmer voting against the district and discovered that "the one negative voter, after the program was explained, changed his opinion."

On August 4, 1937, North Carolina Secretary of State Thad Eure made history when he signed the certificate establishing the Brown Creek Soil Conservation District (SCD) as the first in the State, the Nation, and the world. The actual charter was issued 10 days later.

The event rated large headlines in the State's daily and weekly press, and the news soon spread beyond the State. A newspaper article of the time written by William D. Lee, extension soil conservationist of North Carolina State, gave an apt, still timely definition of a soil conservation district and a clear, concise statement of its potential. Where the author fell short was in his prediction that the district would do away with government subsidies. He failed to foresee the need for State and Federal funds to adequately control erosion.

Once started, the district flourished as it does to this day. First Memorandums of Understanding were worked

out with the Forestry Division of the North Carolina Department of Conservation and Development and with the Soil Conservation Service. Hugh Hammond Bennett, SCS Chief, had helped create the district movement including development of model enabling legislation, which was quickly enacted by a number of State legislatures across the Nation.

The first conservation plan in the first district was on the farm owned by the family of Dr. F. Y. Sorrell. It involved 246 acres and included plans for crop rotation on 121 acres; terracing on 114 acres; waterways (also identified as "meadow strips") on 2.7 acres; one wildlife planting; and considerable land planted in trees.

Another early conservation plan, on 248 acres belonging to J. M. Liles, included 180 acres of improved pasture, 159 acres in rotation, 150 protected by terraces, and an impressive 2,000 feet of border plantings to shelter and feed wildlife.

C. D. Griggs is the present chairman of the Brown Creek SCD board and a farmer in the county. His father was one of the first cooperators and he has

nothing but praise for the district's accomplishments through the years.

"I don't know what we would have done without the district," he said. "The people were desperate in 1937, watching their land wash away, and not knowing where to turn or what to do about it.

"The district has been here to guide and direct us," said Griggs, "and, as a result, the face of the land has been changed and safeguarded. Cotton no longer is the major crop, and there has been a great deal of conversion to woodland, particularly loblolly pines."

No-till farming is very popular today, and the farmers' economic prospects are vastly improved, he says.

The farmers of Anson County in 1937 undoubtedly felt gratified that a concerted program to curb severe soil erosion on their land was underway. But they may not have been aware of the historic significance of the step they had taken together.

Mr. Jeter is public information officer, SCS, Raleigh, N.C.



Over the years, SCS and conservation district people have worked with landowners in solving a variety of conservation problems, such as converting gullies to grassed waterways.

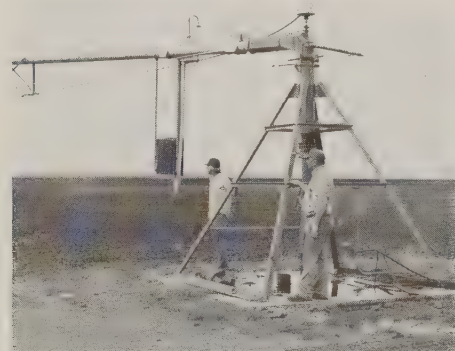
What Is a District?

The following newspaper article was written by William D. Lee, extension soil conservationist of North Carolina State, soon after the first soil conservation district was established.

"What is a soil conservation district? Essentially it is a cooperative association of landowners who will be engaged in carrying out a conservation program. The people involved will help solve their own problems. It will be a process of human as well as material conservation. Since the operation of such a program can be genuinely effective only if it meets the wholehearted support of land operators, each step in setting up the district has been by petition and referendum of the people themselves. Control and direction come from the people . . . for their interests. This permits an almost complete elimination of the tendency toward governmental bureaucracy, and also the doing away of government subsidies."

Windbreak Revival

by Shirley Foster Fields



Wheat farmer Lloyd Klabunde inspects a dying Siberian elm tree—one of hundreds he planted 20 years ago in windbreaks that have protected his crops from North Dakota's high winds. He is replacing the elms with longer-lived green ash trees. Bottom, Klabunde and his son, Wayne, check their pivot irrigation system before applying water to flax and wheat fields.

Windbreaks are only one of several conservation measures that this North Dakota "Farm Family of the Year" has applied on its 1,800-acre farm.

"The wind is mighty strong here all year round. It's mid-July, and it's still blowing at 30 miles an hour. We farmers place a high value on our windbreaks."

So says North Dakota wheat grower Lloyd P. Klabunde who is cultivating his soil in mid-summer to make ready for next spring's windbreak planting of green ash, caragana, American plum, juneberry, and chokecherry trees.

Klabunde's 7 miles of field windbreak Siberian elms are dying, probably of old age. Within the next 2 years, he will have replanted 2 of the 7 miles with a single row of green ash, a hardy long-lived tree.

"Cultivation comes first, a full year before planting," he says. "This eliminates practically all weeds and assures plenty of moisture when the new trees will need it most—immediately after planting."

Klabunde's new farmstead windbreak will be a six-row planting. "First, caragana shrubs in the row farthest from the house, then four rows of trees."

He will plant a single row of fruit trees and shrubs nearest to the house—plum, juneberrys, and chokecherry. The juneberry, he points out, is an early bearing shrub. Its fruit resembles the blueberry.

Windbreaks are only one of several conservation measures that Klabunde has applied to his 1,800-acre farm. He has been a cooperator with the West McLean Soil Conservation District (SCD) since 1959, and in that same year, he signed his first Great Plains Conservation Program contract. Under the contract, the North Dakotan planted his original windbreaks; converted 115 acres of cropland to irrigated pastures; applied wind strip-cropping to approximately 1,500 acres

of wheat, flax, and summer fallow; and planted 7 acres of grassed waterways to prevent soil erosion.

The newest improvements on his land are two center-pivot sprinkler irrigation systems, the first in his county. They were developed with technical assistance from the West McLean SCD to irrigate 250 acres of wheat, soybeans, and flax. His 260-foot-deep well attaches to both systems, pumping 1,000 gallons of water every minute. He operates each of the systems an average of 700 hours a year.

Crop rotation is an integral part of Klabunde's overall conservation plan. From 1972 to 1975, he switched to irrigated alfalfa on cropland previously planted in wheat and averaged 7 tons an acre. Twenty acres of dryland alfalfa yielded 1½ tons per acre in 1975.

Klabunde was winner of the 1976 Farmers Home Administration national Farm Family of the Year award. He and his wife, Lorraine, started farming on 320 acres of rented land in McLean County, N. Dak., in 1946.

Today they live in a recently remodeled home and farm 1,800 acres, 16 miles west of Garrison.

Looking back, Klabunde sees conservation as a continuing process that is as essential to the productivity of his land as the loans that enabled him to get started in the first place. When he evaluates conservation's overall worth, the North Dakotan speaks with blunt simplicity: "It has stopped wind and water erosion on my land."

Ms. Fields is a public information officer, Information Division, SCS, Washington, D.C.

Measuring Windbreaks from the Air

by Richard H. Gilbert

Windbreaks are vital to conservation in the Great Plains. SCS will soon know how many field windbreaks are present in five Plains States, thanks to an aerial inventory.

In infrared photographs, green vegetation appears light gray or white. Field windbreaks in Dickey County, N. Dak., were photographed for SCS from 15,000 feet.

Counting a million trees would be an arduous task, indeed, if we had to walk the ground and make note of each row. But technology has given us an easier, and far less expensive, way.

Beginning in a few weeks, the Soil Conservation Service will inventory windbreak tree plantings in the Nation's five major windbreak States: Kansas, Nebraska, North Dakota, Oklahoma, and South Dakota. Data-gathering will be simplified through remote sensing methods using aerial photographs and photo-interpretation.

The inventory will be the first multi-State windbreak survey to derive information exclusively from high-altitude aerial imagery.

SCS photo interpretation experts will locate, measure, and tabulate windbreaks on 3,375 sections of land in the five States—selected because they contain about three-fourths of all field windbreaks in the Great Plains. A report on each State will be published in October 1978.

The 9-month remote-sensing study will cost \$57,000, less than one-third the amount an "on the land" survey would cost.

The inventory follows a 1975 General Accounting Office (GAO) report calling for action to discourage removal of windbreaks in the Great Plains. The GAO report noted the need for accurate and up-to-date information on the number of field windbreaks in the region, the amount of removals during recent years, and the reasons for the removals.

During a recent pilot study of nine counties in the five States, SCS determined that the remote sensing method is 95 percent accurate in locating and measuring windbreaks. Comparing aerial photos taken in 1970 and 1975, SCS's remote sensing team



measured farmstead and field windbreaks on 230 sections of land. The pilot study showed that the average reduction of field windbreaks in the nine counties was less than one percent per year. The upcoming, expanded study will determine whether this preliminary finding is typical of tree removals throughout the five major windbreak States.

The U.S. Government has been involved in tree planting in the Great Plains States for more than 100 years. In 1873, the Timber Culture Act offered homesteaders 160 acres of land if they would plant 40 of those acres in trees. The act was repealed in 1893, but not before millions of trees had been planted.

During the Dust Bowl days of the 1930's, the government again planted

trees in the Great Plains. Under the Prairie States Forestry Project of 1935, more than 200 million trees were planted in North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. When the project ended in 1942, more than 238,000 acres of windbreak trees had been planted by the Works Progress Administration and the Civilian Conservation Corps. The combined length of the windbreaks exceeded 18,000 miles.

Mr. Gilbert is leader of the Remote Sensing Team, Land Inventory and Monitoring Division, SCS, Reston, Va.

A farmer in Montana has found that tall wheatgrass barriers conserve moisture by trapping snow, protect against wind erosion, and decrease moisture evaporation in summer.

Tall Wheatgrass Barriers



Snow trapped by tall wheatgrass on Mohn's farm near Flaxville, Mont., approaches the tops of 3½-foot barriers.

ice's Northern Plains Soil and Water Research Center, Sidney, Mont., which works closely with local farmers and the Soil Conservation Service. SCS has been recommending wheatgrass barriers since 1971 for certain locations, including central and eastern Montana. The practice has been finding increasing favor with farmers in those areas.

Mohn's barriers—two rows of tall wheatgrass spaced 3 feet apart—are separated by 67 feet of cropland. He chose this strip width to allow for two passes with his drill.

Mohn's first planting of tall wheatgrass barriers in 1971 failed. He blames the failure on inadequate seedbed packing and soil crusting, which killed the seedlings before they reached the surface.

The following year, Mohn modified a "pony" drill for planting wheatgrass. The drill has rubber tires for packing and a depth control that prevents the seed from being placed more than 1 inch deep. Spring planting with this drill has resulted in satisfactory stands.

Since his first successful planting in 1972, he has planted additional barriers each year.

After 3 years of continuous cropping on the fields where barriers were first established, Mohn found that overall farm production was greater than it was with summer fallowing.

He grows winter wheat and spring wheat in alternate years. The yields of both have been good, even though winter wheat is not commonly grown in northeastern Montana.

Mohn also grows hay between some of his tall wheatgrass barriers, seeding alfalfa in strips where the sandy soil blew easily. Mohn discovered the hay yields were surprisingly good because of the additional moisture from trapped snow. In some years he has taken a second cutting—unusual for dryland hay in eastern Montana.

By rotating winter wheat and spring wheat and applying herbicides, Mohn has reduced weeds associated with continuous cropping. The tall wheatgrass is not affected by herbicides used to control broadleaf weeds.

Wild oats and pigoengrass, however, have increased. To counter this problem, Mohn plans to include safflower in his crop rotation. Weedy

grasses can then be controlled with herbicides that would kill small grains.

Mohn cultivates his barriers twice a year with a modified toolbar. He also fertilizes them with nitrogen to promote growth and maintain the height of the tall wheatgrass. Of course, thicker and taller barriers will trap more snow.

The barriers and continuous cropping have almost eliminated wind erosion, Mohn said. Strips to be planted to spring wheat are worked in the fall to leave them in a roughened condition. This provides further protection against blowing during the winter and early spring.

Selected as Outstanding Farmer of 1976 by the Daniels County Conservation District, Mohn is conscientious about saving soil and moisture. On some of his hayfields where tall wheatgrass barriers have not been established, he has used a blade on his tractor to "windrow" snow. The rows act as a snow fence, trapping enough additional moisture to produce a second cutting of hay.

Mohn has even windrowed snow away from his tall wheatgrass barriers to distribute the snow more evenly across the strips of cropland. He is sure that increased grain yields more than pay for the time and fuel used, although he has not yet collected data to prove it.

The Montana farmer admitted that it takes more care to farm around the barriers. There also are higher production costs for continuous cropping, such as herbicides and fertilizer.

"In the right place, and with extra management and care, tall wheatgrass barriers are definitely an asset in my kind of farming," Mohn said.

Mr. Campbell is range conservationist, SCS, Glasgow, Mont.



Farmer Mohn has discovered that tall wheatgrass barriers hold moisture and reduce erosion and evaporation from wind.

"Summer fallowing wastes moisture; tall wheatgrass barriers and continuous cropping conserve it," according to Donald R. Mohn, a farmer near Flaxville, Mont.

Mohn, who farms 1,200 acres of sandy cropland in Daniels County, has tall wheatgrass barriers in various stages of establishment on his land.

He has found that tall wheatgrass not only traps snow and conserves moisture, but that it also produces other valuable benefits. One is increased protection against wind erosion; another is the decrease in evaporation of moisture by summer winds.

Mohn learned about the barriers from the Agricultural Research Serv-

More farmers need to be alerted to the fact that fall tillage in cropland fields can cause a double loss—soil and wildlife.

A large portion of the diet of wildlife in many States is rowcrop grain left in fields after harvest. Corn stalks, milo stubble, and other vegetation also provide cover for wildlife as it feeds on waste grain.

The same residue will provide soil surface cover to soften the force of falling raindrops and help absorb moisture, cutting down on soil erosion.

In Missouri, however, the following tillage practices are fairly common between October and December—with these disastrous results for wildlife and soil conservation:

- moldboard plowing—100 percent of crop residues covered;
- single disking—60 percent of residues covered;
- single trip with field cultivator—40 percent covered;
- single trip with chisel plow—30 percent covered.

With no-till, of course, there was no loss of residues.

Mr. Ponder is field service agent,
Missouri Department of Conservation,
Kirkville, Mo.

Mr. Mackey is district conservationist,
SCS, Edina, Mo.

Slogan of Missouri campaign against fall plowing is: "When soil is bare, wildlife's rare."



Fall Tillage Means Double Trouble

by Duke Ponder
and Dave Mackey

Like most techniques to combat erosion, good soil conservation practices are also good for wildlife populations.



Baling removes residues from fields. Besides supporting wildlife, "trash" left on fields may save tons of soil per acre.



Corn residues left on ground during winter provide high energy diet for Missouri's resident game species.

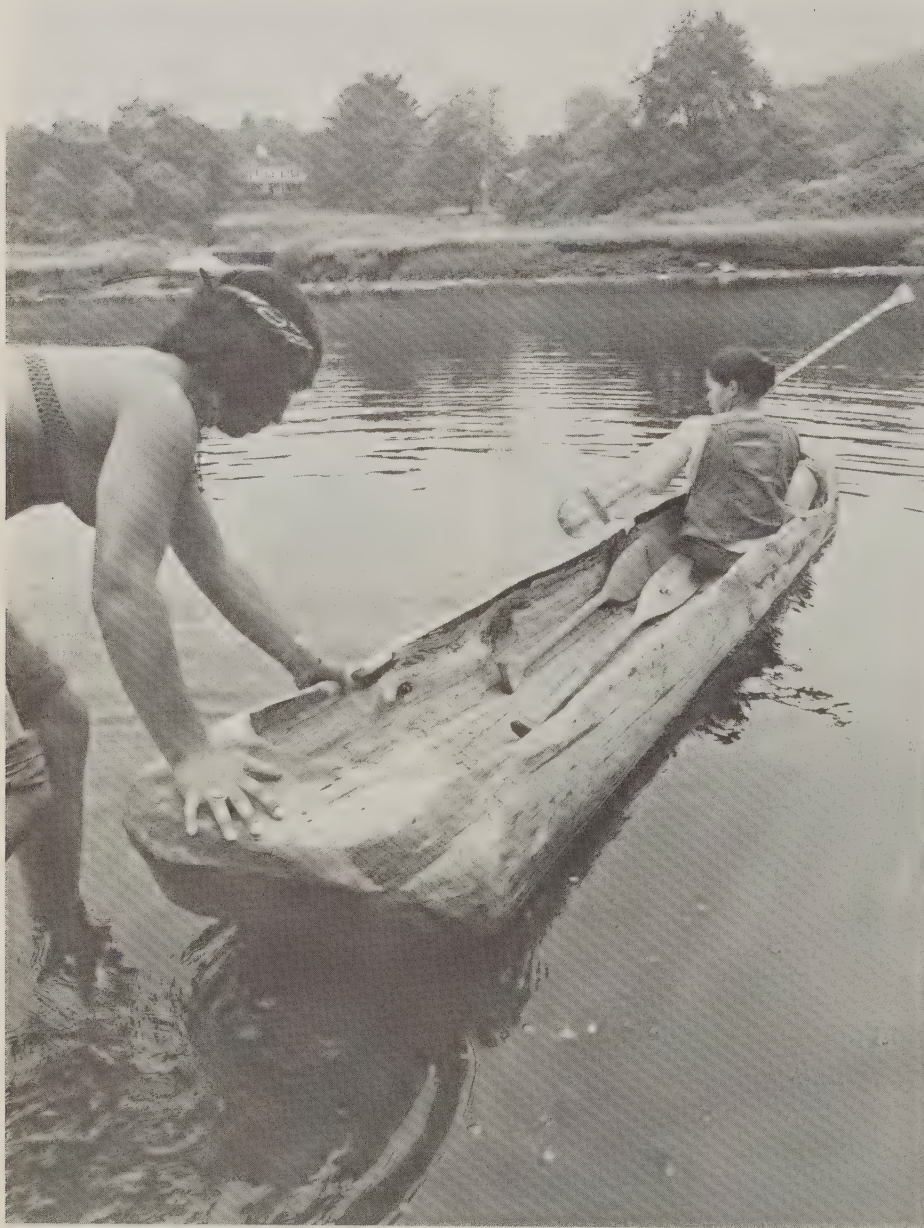


Canada geese use harvested cornfield as feeding area on their fall trip South.

The Mashpee Wampanoag Tribal Council turned back the clock 300 years in dedicating a historic Indian canoe passage in southeastern Massachusetts.

by Bud Reese

A Canoe Trip Through Indian History



Two Wampanoag women launch their dugout canoe into the North River channel after the dedication ceremony. The 350-pound canoe was made from a large white pine tree by members of the tribe and is handcrafted using native methods.

Through the morning mist on the North River, a group of Wampanoag Indians could be seen silently paddling their canoes past salt marsh and woodland.

Does it sound like something that could only have happened hundreds of years ago? It was August 28, 1976.

On this day, Drifting Goose (Ellsworth Oakley, Jr.), Supreme Sachem of the Wampanoag Federation, led the ceremony dedicating the Wampanoag Sachems Canoe Passage to the memory of the great past Wampanoag leaders, especially Massasoit, the Supreme Sachem of the Wampanoag Federation who was among the first to greet the Pilgrims, and to his two sons who succeeded him, Wamsutta and Metacomet (King Philip). Two young tribal members were first to launch their canoe, handcrafted from a large white pine tree.

A year earlier, the Mashpee Wampanoag Tribal Council and the Plymouth County Development Coun-



cil in southeastern Massachusetts had wanted to restore the historic 70-mile waterway. It winds its way from Scituate on Massachusetts Bay to Dighton Rock State Park on the Taunton River and flows into Narragansett Bay.

They wanted to preserve the scenic canoe passageway that the Wampanoag Indians had used as long as 300 years ago and reopen it to canoeists. The 16 communities along the meandering passage supported the project.

The Pilgrim Resource Conservation and Development (RC&D) Area Council made the restoration of the passage part of the area's RC&D plan. The Soil Conservation Service, through the RC&D office, prepared a map of the canoe passage, located trouble spots—rocks, white water, and shallow areas—and obstacles at portages, provided soil and water resource information, coordinated the

work on the project, and recommended future sites for camping, scenic areas, and rest stops.

The Plymouth County Development Council, in cooperation with many other local agencies, organizations, groups, and individuals, prepared a brochure which gives a brief history of the passage and includes detailed maps of the watercourse. It is a guide to portages, camping areas, points of interest, and trouble spots along the waterway.

There is easy access to the passage at many points. It can be explored in day or half-day trips or for just an hour or two. It would take 3 to 5 days to cover the entire route depending on the tide and water level.

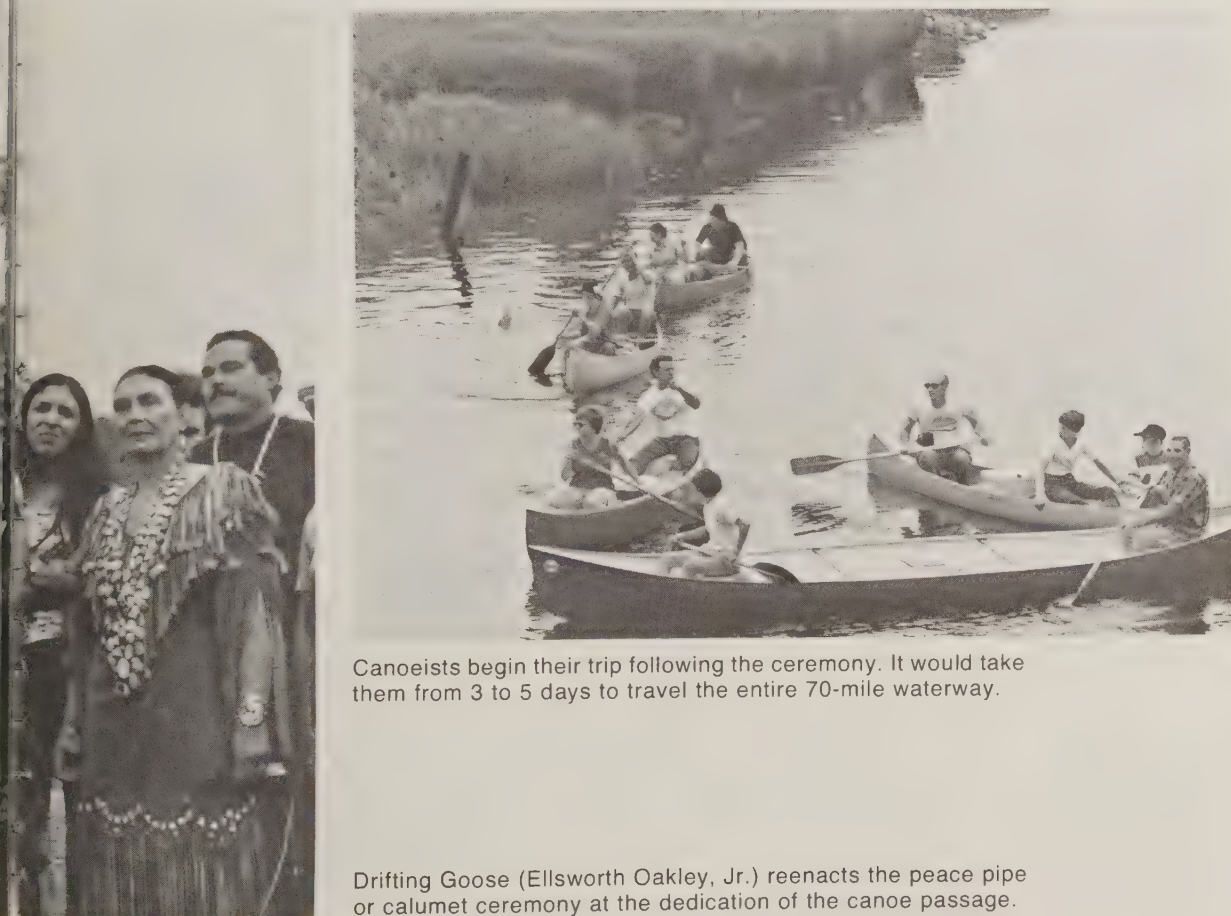
Indian trails, colonial cemeteries, and the sites of shipyards dating back to the 1600's are along the banks of the Wampanoag Sachems Canoe Passage. Canoeists glide past areas of rushes and reeds and through

brooks with overhanging branches and underwater beaver dams. They also paddle past superhighways. Occasionally a deer has been sighted, and several foxes and a multitude of herons, partridges, frogs, snapping turtles, muskrats, and ducks are commonly seen along the passage.

Amelia Bingham of Mashpee, a member of the Massachusetts Commission of Indian Affairs, the Pilgrim RC&D Area Human Resources Committee, and the Mashpee Wampanoag Tribe, said, "Through this canoe passage, southeastern Massachusetts offers everyone an opportunity to step back into the past and experience the marvels of nature."

Mr. Reese is RC&D coordinator, SCS, Raynham, Mass.

Photos courtesy Plymouth County Development Council, Inc.



Canoeists begin their trip following the ceremony. It would take them from 3 to 5 days to travel the entire 70-mile waterway.

Drifting Goose (Ellsworth Oakley, Jr.) reenacts the peace pipe or calumet ceremony at the dedication of the canoe passage.

Planned Grazing: A Beautiful System

A rancher in Arizona has increased his grass and cattle production, reduced erosion, and attracted more wildlife.

by Doug Immekus

In Arizona, beauty can be found as a result of erosion. The Grand Canyon and Painted Desert were created through eons of geologic erosion. The wood in the Petrified Forest was revealed by the same process.

Unfortunately, accelerated erosion, usually caused by man's misuse of the land, has not resulted in similar majestic creations. Overgrazing of rangeland in Arizona has contributed to erosion and sedimentation. It has left much of the land depleted and scarred. Because of overuse, nature's original plants were replaced by others of little value for grazing or soil protection.

Hard rains on depleted lands ran off quickly taking tons of topsoil. Once-plentiful wildlife was reduced, and man struggled to make a living from what remained.

But some people realized that with hard work and a temporary reduction of income they could restore beauty and productivity to the land.

Beverly Thomas, of Navajo County, was one of those who accepted the challenge. Juniper and other unpalatable plants had replaced the grasses and shrubs that provided food for cattle and wildlife on his ranch. The sparse plant cover was an invitation to erosion.

As a cooperator with the Navajo County Natural Resource Conservation District, Thomas developed a plan for his State and private land in 1963. In 1964, when Thomas took over the Cottonwood Allotment from his brother, he and a Forest Service em-

ployee made an allotment analysis that showed just how much the range had deteriorated. They developed another plan for improving the land.

From 1965 to 1967, he managed his range using these two separate plans. Then realizing the necessity of managing the total ranch as one system, he requested the Soil Conservation Service and Forest Service to assist him in developing one coordinated plan.

A key feature of the coordinated plan, developed in 1968, was a four-pasture, single herd grazing system. In addition, brush management, range seeding, water development, and fencing were planned. Thomas said, "The plan has required a lot of work and money, but it was worth the effort."

"I remember when it used to take 15 cowboys to gather our cattle," he continued. "We used to have a real rodeo. Now it only takes me a day to move the cattle to the next pasture with my pickup, its horn, and a couple bales of hay for bait. Today when the cattle hear the horn, they know it's time to move."

His planned grazing system required 8½ miles of fence construction or repair. He had to cut his herd until new water facilities were developed and range seedings were established. The improvement costs and fewer animals created a hardship for 2 years. However, Thomas quickly built his herd back.

Between 1968 and 1976, brush management and range seeding were

carried out on 12,000 acres. In addition, several stock water systems were installed, including a 20,000-gallon storage tank.

His biggest problem was finding financial help. "The Forest Service cost shared on a 50-50 basis some of the improvements on National Forest System land. The Agricultural Stabilization and Conservation Service cost shared water developments and brush management on the private and State lands. However, I had to pay half the cost."

Thomas is already counting the benefits. "My cattle are easier to handle because they are all in one pasture. I can brand, wean, and treat for disease and insects quickly with this system. As a result, my cow herd is improving, the calving percentage is up, weaning weights are heavier, and disease problems are down."

"In addition my supplemental feeding has been cut in half as a result of increased forage production," he said. "These benefits offset the sacrifices and work I had to do during the first few years."

"During the next 10 years, I feel sure my efforts will increase the value and returns of my operation. However, the benefits of this planned grazing system accrue not only to me, but also to the public, in increased wildlife and a more attractive landscape."

Mr. Immekus is district conservationist, SCS, Holbrook, Ariz.



Tom Chacon, range conservationist, Sitgreaves National Forest (left), rancher Beverly Thomas, and David Somerville, SCS range conservationist, discuss the results of brush management and reseeding on Thomas' ranch.



Farmer Henry Hughes still uses his mule to do work his tractor can't do.

Long-Time Conservationists

Henry Hughes has held to some farming techniques for years. But when it comes to conservation, "my old-timey ways don't mean I have old-timey ideas."

Wally Morris thought he had retired. When the Forest Service needed conservation help, Wally was there.

Gladys Horn has been farming for 43 years. When some of her land developed gullies, she found out that it's never too late for conservation help.

Henry Hughes

by Gene Warren

Henry and Elva Hughes do things the old-fashioned way, but get modern results.

They bought their 40-acre farm near Livingston, La., in 1941 and "cleared the whole place with a double-bitted ax and a crosscut saw," according to Hughes. "It was a rough job, but I wouldn't trade this place for anything."

He walked through a sloping field of deep grass and clover where several fat cows grazed. "I've got this particular land in grass for a reason. When I originally was making my conservation plan, the Soil Conservation Service man pointed out that this land was too steep for crops."

Hughes is the Capital Soil and Water Conservation District's current Outstanding Conservation Farmer. The award cites his use of such conservation practices as crop rotation, use of crop residue, grazing rotation, and a farm pond for livestock water.

Half his land is used for 11 cows and

Wally Morris checks the growth of Austrian pine seedlings he planted 3 years ago. The trees are among those found at the Moses Lake Nursery he helped establish.

—courtesy, *Columbia Basin Herald*.



Hughes has half his land in improved pasture for his cows and the other half in truck crops.

the other half for a number of truck crops. Several acres are planted with shoe-peg corn, a special variety for which he has been saving seed for 37 years.

Most of the food Henry and Elva eat comes from their farm: chicken, pork, beef, milk, butter, eggs, more than two dozen vegetables and fruits, and fish from the pond. Much is processed with machines and tools the family has used for decades.

Hughes also has a number of "paying customers" who gather vegetables on his farm. "People take only what they pay for, and most folks come back year after year. Some come all the way from Baton Rouge, more than 40 miles, and get corn and peas," he said.

Although Hughes uses a tractor to prepare his land for planting, his mule "Mike" gets plenty of work. "A mule can do a lot that a tractor can't. When corn gets waist-high, that tractor would ride it down if I plowed through it," he said. "But old Mike just plods along doing what I ask him to."



After 36 years, Hughes says, he's learned a lot about the needs of his land. "My old-timey ways don't mean I have old-timey ideas. I work hard to do a good conservation job out here because it's right and because it pays in the long run."

Mr. Warren is public information officer, SCS, Alexandria, La.

Wally Morris

It looks like Wally Morris will never really retire.

On April 22, Morris, a soil conservation technician, retired after 28 years with the Soil Conservation Service at Moses Lake, Wash. The next day he was taking care of about 30,000 seedling pine trees that the Forest Service had intended to plant in northwest forests.

Drought conditions delayed planting, and Morris agreed to help the Forest Service by taking care of the trees through the delay.

Growing trees comes naturally to Morris who has helped beautify and

protect his area of the Columbia Basin for almost 30 years through tree establishment programs that he helped initiate.

A coworker at the SCS district office said, "Wally has worked untiringly with many basin residents. If you're a farmer, he probably raised from seed the trees in your established windbreak; and if you're a Boy Scout, he probably helped you plant the willows and poplars that give shade at Potholes Reservoir."

Morris has done a lot of work on conservation education for youth. He has taken school children on field tours, appeared on a children's television program to talk about conservation, and worked with youth groups on conservation and public service projects.

For his work with the Boy Scouts, he received the Silver Beaver Award, the highest adult honor on the council level.

While Morris was chairman of camping and activities, the Columbia Basin District received the William T. Horna-

Gladys Horn and Bert Geswein, SCS technician, look over newly installed riser on her tile-outlet terraces.



As part of his work in conservation education, Morris appeared on the "Romper Room" show. He brought soil samples for the children to see and touch and gave them pine seedlings to plant and take home.



day Award from the Boy Scouts of America for distinguished service in conservation.

This year the Inland Empire Chapter of the Soil Conservation Society of America gave Wally Morris their 1977 plaque for his outstanding contribution to conservation and his help in establishing the district's Moses Lake conservation nursery.

Wally Morris has always been ready to help solve soil and water conservation problems.

Adapted from an article in the *Columbia Basin Herald*, Moses Lake, Wash.

Gladys Horn

by Michael M. Price

"People thought I was terribly foolish to spend my money on eleven terraces when I could use it to buy a nice car," said Gladys Horn, 78, of Clay City, Ind. Mrs. Horn had wanted the terraces since 1970 to halt severe erosion and flooding of her 60-acre farm.

A farmer's daughter, Mrs. Horn used

to put up hay and drive her father's team of horses to disk the fields. "The hardest work I ever did was to replant corn with a hoe," she said.

In 1934 she inherited her father's farm. Together she and her husband farmed it until his death in 1968. Now a tenant farms her land.

Although the Horns had seeded some pastures, rotated crops, and leveled some of the land, several gullies developed on unprotected land—some so deep "you could hide a horse in them," she said.

"The soil kept washing down the slopes and across the road, filling my neighbor's roadside ditches with silt. One of my neighbors became very upset with me because water from my farm ended up on his land. So, he built a small levee to protect his place from my water," she said.

Mrs. Horn learned about the Soil Conservation Service and the Clay County Soil and Water Conservation District from local newspapers. She became a cooperator with the district and, with assistance from SCS, de-

veloped a conservation plan for her farm in 1972.

SCS provided technical assistance on survey and layout work for a series of terraces designed to hold water on the hills until it can drain slowly through tile outlets. Mrs. Horn's parallel tile-outlet terraces—built over a 5-year span—were the first such terraces in the county.

Mrs. Horn is pleased with the results of her long-awaited terraces. "In fact," she said, "the corn yield has doubled in some places on my farm."

Mr. Price is public information officer, SCS, Indianapolis, Ind.

A community in Arkansas—including bakeries, the telephone company, and a papermill—pitched in to help elementary school children create an outdoor classroom.

by Elesa K. Tanprasert

From Trash to Trail



During Terry School Work Day, students lined a nature trail with rocks. Each student who worked on the trail received a special nature badge.

Students at David Terry Elementary School in Little Rock, Ark., are getting a new classroom—in the woods.

What was once a trash-laden neglected acre-and-a-half is now an attractive outdoor classroom with a learning trail where more than 500 kindergarten through third grade children are finding out about their environment.

The project was started last September after Sandra Case, the City Beautiful Chairman for the school, first heard of outdoor classrooms and Soil Conservation Service help for teachers during a meeting of the city council in Little Rock.

Case discussed the idea of an outdoor classroom with the principal of Terry School, Charlsie Brown, who responded with such enthusiasm that Terry School this spring won a top award in the City Beautiful school category for having done the most to improve the school site.

"Work began last fall as soon as a technician from the SCS field office could meet with the teachers," Brown said. Following the site inventory, Sandra Case arranged for a visit to an outdoor classroom at another school to see the students in action and to gain ideas.

Several meetings were held to acquaint parents, faculty, and PTA board members with the project. A Terry School Work Day was set for October.

By the time the Work Day arrived, the learning trail had been blazed with the help of SCS conservationists, who had identified interesting learning sites, and Cub Scouts, who had

cleared a path in preparation for Work Day activities.

More than 200 parents and children arrived early on Work Day with rakes, shovels, baskets, and lots of enthusiasm. As the adults removed trash and debris and stockpiled brush for wildlife, students gathered stones and outlined both sides of the trail. Woodchips from a local papermill were used to mulch the trail.

Several local bakeries donated cookies, cakes, and doughnuts for refreshments. Many families brought picnic lunches. Each of the students who worked on the trail received a special nature badge.

Two local television stations covered the scene for the evening newscast, interviewing students, parents, and teachers.

The Terry Primary Outdoor Study Area continues to grow with community help. The construction department of the local telephone company donated poles to be used for seats in the amphitheater. A local contractor provided a bulldozer to construct a low-water dam on the marshland study area. The Society of Older Workers volunteered their services to construct the amphitheater seats and three footbridges across the marsh. Several workers plan to come back and help when school starts in the fall. Pulaski Conservation District donated an entrance sign for the learning trail.

As teachers developed lesson plans and discovered new learning activities in the outdoor classroom, they taped these suggestions and placed them in the media center for use by other schools. A brochure is available for visitors to the nature trail.

The conservation plan for the school site includes planting projects for erosion control and wildlife. A geology wall and weather station are to be added to the outdoor classroom—a continuing project that will change and grow to meet the needs of future classes at Terry Elementary School.

Ms. Tanprasert is soil conservationist, SCS, Little Rock, Ark.

Until sand blowing from a commercial development site was tied down, it "blasted" paint off cars, ruined windshields, and proved a nuisance to an apartment complex.

by Dale Allen

Rescuing Barley Square



J. W. McDonald, SCS district conservationist, examines barley planted on a commercial development site to control wind erosion.

El Paso residents call it Barley Square. It's their nickname for a 20-acre commercial development site that was planted to barley to keep the sand from blowing.

Cover from the land was stripped by its developer when he graded the land early in 1974. Since average annual rainfall is only 7 inches per year in El Paso, it takes years to reestablish a natural cover of plants. And from November to May, the wind blows and blows—and blows some more. Blowing sand can ruin a windshield or an auto paint job in a matter of seconds.

It also can prove a confounded nuisance to a plush apartment complex, like the one across the street from Barley Square.

"We really caught the sand," recalled Ann Welch, manager of the complex. "In one day, it would pile up 3 feet deep on your front lawn. It took tractors, front-end loaders, and a dump truck to clean it up and haul it off."

She said the fine sand also found its way beneath windows into apartments facing the square.

Naturally, she complained. The developer tried to hold down the sand by wetting it with a sprinkler irrigation system. But the wet sand still blew—this time as mud onto passing cars. Then the El Paso police would tell him to shut down his sprinklers.

Local Soil Conservation Service District Conservationist J. W. McDonald came to the rescue. Under provisions of an El Paso grading ordinance, anyone who performs significant land grading must submit a grading plan to

the city, and the city then issues a permit.

Grading plans for tracts of 25 acres or more are referred to the El Paso-Hudspeth Soil and Water Conservation District for review and comment. The district asks SCS people to study the plan, visit the site, and make recommendations for controlling erosion from wind and water. These suggestions are returned by the district to the city engineers.

Although developers are not required to follow SCS recommendations, many do so voluntarily, like the owner of Barley Square.

Since it was February, McDonald suggested that the developer plant his 20 acres to barley, a cool season grass. City water and a sprinkler irrigation system got the seed to germinate. In 2 weeks, the barley had produced enough cover to keep the sandy soil from blowing. Seven months later, the barley's dense, stiff stalks still had the soil tied down.

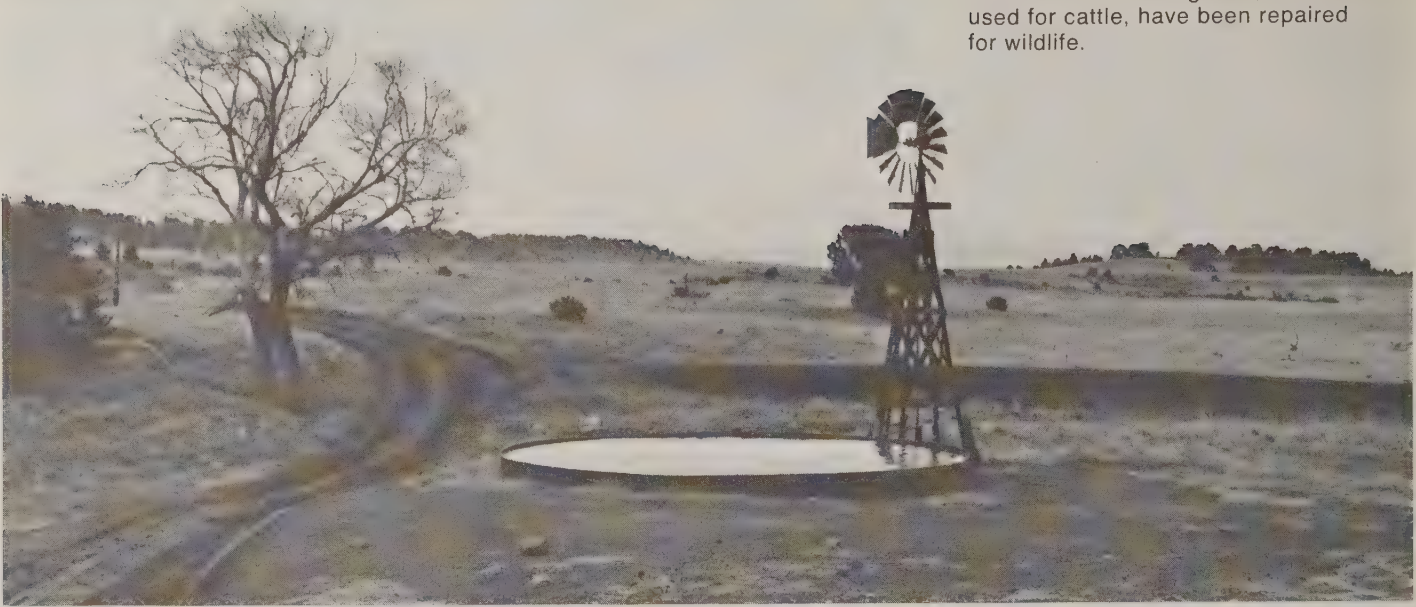
"Except for lawns," commented Ann Welch, "the new barley was the only green spot in town."

McDonald said that since the El Paso ordinance went into effect, some 80 grading plans have been submitted to the district for review.

"Either all or part of our recommendations have been carried out on about half the land affected," he reported. "While not perfect, it isn't a bad score for a voluntary program."

Mr. Allen is public information officer, SCS, Temple, Tex.

Windmill and drinking tank, once used for cattle, have been repaired for wildlife.



The National Rifle Association promotes good natural resource management using various conservation plans while teaching people about the use of firearms and gun safety.

Conservation Classroom for Gun Club Instructors

by Dick Barber

A rugged 57-square-mile "classroom" where students learn the proper use of firearms, wilderness survival, and conservation is open for business in northeastern New Mexico.

It is the National Rifle Association's (NRA) new National Range and Outdoor Center, used primarily to train marksmanship instructors for schools and clubs.

A tour of the center last April began just off State Highway 64, which forms much of the eastern boundary, several miles southwest of the town of Raton. My guide was Frank Foote, NRA field manager in the area.

Frank and I bounced along through gently rolling prairie covered with blue grama, western wheatgrass, and other native grasses. The small, unpaved road soon crossed the old Santa Fe Trail. Railroad grades, long abandoned, wandered off in a westerly direction. If we followed, they would lead to abandoned mines and timber landings in the canyons and foothills of the Sangre de Cristo Mountains.

"A team of specialists evaluated sites in several States before we decided on this one in 1974," Frank said. "The Colfax County Soil Survey prepared by the Soil Conservation Serv-

ice was the single most valuable tool the team had."

We passed areas once scarred with gullies. Banks had been recently sloped, and an arroyo had been graded and shaped into a natural looking drainageway. Young blades of grass were emerging through mulch applied after seeding, and Frank said he was hoping for rain.

"All this is a sample of the work we are doing in cooperation with the Colfax Natural Resource Conservation District," he explained.

"We also have a contract with more than 80 items under the Great Plains Conservation Program and have a basic conservation plan developed with SCS help."

The center is hunters' country. In the distance, we saw a herd of pronghorn antelope grazing. Frank promised that as we got closer to the mountains, we might spot a mule deer browsing on oak or buck brush or hiding among the pinon pine and juniper.

We drove through a large clearing, surrounded by native plants like yucca, cholla, rabbitbrush, and fourwing saltbush. This was to be the site of the 1977 NRA Instructor-Shooter School. The course includes instruction in rifle,



Frank Foote, NRA field manager, examines recently seeded drainage way for signs of grass.



One of the critically eroding areas at the center looks better after grading, shaping, and seeding under Great Plains Conservation Program contract.

pistol, shotgun, gunsmithing, re-loading—and conservation.

We lunched at Willow Canyon with students in the Spring Survival Leadership Training School. They had just learned to make fires without matches or much of anything else. An instructor invited us to climb the mesa and watch the class devising and setting snares. Students are not limited to men; Audrie Brown of Connecticut called it "a great experience" as she smeared waterproofing on her boots.

We left Willow Canyon just ahead of a shower—perfect weather for a survival school. In other canyons nearby, a turkey hunt was in progress, with 50 percent success already reported, according to Frank. That was even better than last fall's 38 percent success on an elk hunt.

Our four-wheel drive vehicle began to climb through muddy roads. The pinon and juniper were left behind, and we saw thickets of ponderosa pine and a few firs.

An occasional stray cow shared the grazing on slopes with elk, deer, and antelope. Out of sight were their natural enemies: mountain lion, bobcat, and coyote. Stray cows and horses are all that remain of domestic animals;

since they were removed by NRA, the forage has improved considerably.

Frank pointed to several water facilities for wildlife and said that more were on the way.

He said NRA is interested in good natural resource management as well as teaching the use of firearms and gun safety.

"Specifically we are concerned with wise land use, with conservation and improvement of wilderness, and with wildlife—enhancing its food and habitat and its proper harvest," he said. "This area gives us a wonderful opportunity to teach people about conservation."

Frank explained that NRA also is trying to interest more colleges and universities in using the center for resource management studies. Already using the facility are the University of New Mexico, Michigan State and Colorado State Universities, and Trinidad State Junior College. The center also is used for field training for the New Mexico National Guard.

Frank's relatively small staff is augmented by technical help from the New Mexico Game and Fish Department, SCS, and others. A resource inventory, conservation needs, and activity

schedule are all contained in the NRA conservation plan.

"We plan a minimum of development," Frank said. "Some camping facilities are in the works, and the city of Raton had agreed to furnish domestic water through a pipeline to be installed. The city will recover the cost many times over through revenue from sales and other indirect taxes paid by participants in NRA activities."

"We've also completed about 100 acres of critical area erosion treatment and are installing net wire diversions for erosion control. Most of all, we want to protect the land from overuse. It took 20 miles of fence to do it, but we now have the entire unit fenced."

"To be effective advocates of proper land use and conservation," he said, "we can't just talk about it. We have to set a good example, and let our students see what we are doing—and live with it."

Mr. Barber is public information officer, SCS, Albuquerque, N. Mex.

New Publications

Retention of Agricultural Land

by the Soil Conservation Society of America

This is a collection of six articles reprinted from the *Journal of Soil and Water Conservation*. The articles focus on the effort to preserve prime farmland in the United States.

One article concerns the need for national guidelines in developing a useful definition of prime agricultural land for States and communities to use in making land use policy and legislation.

Two articles deal mainly with methods of government control of land use and the issues surrounding the development of effective land use policy and legislation, locally and nationally. They cover State planning and enabling acts, mandatory planning and zoning, preferential assessment, special permits, easements and development rights, and other alternatives.

Two other articles deal specifically with what New Jersey and California are doing to preserve their prime farmland and open spaces.

One article is about USDA's role in preserving prime farmland—collecting and interpreting resource data that others can use in making sound decisions about land use and the future of agricultural lands. It describes the Soil Conservation Service's important farmland inventory system and its use of an automated mapping system.

Photographs, tables, charts, and graphs illustrate the publication, and a list of references follows each article.

Copies of special publication No. 19 are available from the Soil

Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. Single copies are \$2. Prices differ for quantity orders.

Conservation Tillage: Problems and Potentials

by the Soil Conservation Society of America

This is a collection of 12 articles, most reprinted from the *Journal of Soil and Water Conservation*, that gives an overview of current efforts in conservation tillage.

One article concerns the need to make conservation tillage and other conservation measures an integral part of any land use system. Another article tells how conservation tillage has resulted in energy savings and how this savings can be expected to increase.

The other articles describe conservation tillage practices used in the eight farming regions of the United States and in eastern and western Canada. They cover varied aspects of conservation tillage including reduced-tillage planting; no-till planting; economics of no-tillage; insect management; weed control; tillage effects on erosion, water conservation, and fertilizer; crop response to tillage; selecting tillage tools; and problems with residue tillage.

Photographs, tables, and graphs illustrate the publication, and a list of reference works follows each article.

Copies of the special publication No. 20 are available from the Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. Single copies are \$3.50. Prices differ for quantity orders.

Trees, Soils, and People

by the Soil Conservation Service

This publication is a collection of six articles on trees and woodlands reprinted from *Soil Conservation* magazine. The articles are about managing woodland for improved timber production, for wildlife habitat, for recreation, and for esthetic value. They also cover forest-cutting and logging practices

that help prevent erosion and improve water quality.

Single copies are available from local conservation district offices or from the Information Division, Soil Conservation Service, Room 0054-S, Washington, D.C. 20013.

'Cape' American Beachgrass

by the Soil Conservation Service

This full-color pamphlet explains and illustrates step-by-step how to plant and maintain 'Cape' American beachgrass. Planting 'Cape' has proved to be the most effective way to stabilize dunes and areas of shifting sand in coastal areas from Maine to North Carolina.

Single copies are available from local conservation district offices or from the Information Division, Soil Conservation Service, Room 0054-S, Washington, D.C. 20013.

Soil Erosion: Prediction and Control

by the Soil Conservation Society of America

This is a collection of the 42 papers presented at the National Soil Erosion Conference held at Purdue University in May 1976.

The book is dedicated to W. H. Wischmeier of USDA's Agricultural Research Service and Purdue University, now retired, who led a team of scientists in developing the universal soil loss equation. Several papers in the book deal specifically with the equation's application in different geographic areas and in a variety of land planning situations. Topics covered in the papers also include erosion research, erosion and sediment yield modeling, soil erosion control, and conservation needs.

Graphs, charts, tables, maps, and photos, illustrate the book and a list of references follows each paper.

Single copies are available from the Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. Copies are \$10; \$7 in paper.

Conservation Means "Liquid Assets"

To the father and son team of Frank and Hal Holder, efficient use of irrigation water is like money in the bank.

Hal, who took over management of the 280-acre farm near Rocky Ford, Colo., from his father last March, has recently intensified his conservation efforts by obtaining a Great Plains Conservation Program (GPCP) contract through the East Otero Soil Conservation District.

Many water-saving techniques have been applied to the land in the past by Hal's father, a 28-year veteran of the produce business in the Rocky Ford area. Hal plans to add more.

According to Ben Berlinger, Soil Conservation Service range conservationist, Hal has done more than many farmers in the area on soil and water conservation. And the Holders' conservation plan could prove very beneficial with streamflow reports for the Arkansas River down to 50 percent of normal.

When Frank Holder purchased the acreage, it was quite different than it looks today. It included three separate farms, unleveled and unworked, and an old railroad spur.

Today the tracks are gone, the fields are level and bordered by concrete irrigation ditches, and the land is rich in pearl onions, lettuce, and alfalfa.

Among practices Hal intends to increase under his GPCP contract are land leveling, concrete ditch lining, and grade stabilization structures.

He will also seed several fields to grass and alfalfa to utilize the tailwater from irrigated onion fields.

Conservation practices completed and planned on the Holder farm could well mean money in the bank if the water outlook for the Arkansas Valley doesn't improve.

Adapted from an article in the *Arkansas Valley Journal*, La Junta, Colo.

Meetings:

September

- 25-28 American Society of Landscape Architects, Minneapolis, Minn.
- 24-27 Farm and Industrial Equipment Institute Convention, Hot Springs, Va.
- 25-29 International Grain and Forage Harvesting Conference, Ames, Iowa
- 28 Clean Community System National Seminar, Keep America Beautiful, Inc., Washington, D.C.

October

- 2-6 Congress for Recreation and Parks, Las Vegas, Nev.
- 2-6 National Association of County Agricultural Agents, Hartford, Conn.
- 2-7 Water Pollution Control Federation Conference, Philadelphia, Pa.
- 8-12 American Institute of Planners Conference, Kansas City, Mo.
- 14-20 National Environmental Sanitation and Maintenance Educational Conference, Exposition, Lake Buena Vista, Fla.
- 15-19 American Bankers Association, Houston, Tex.
- 16-19 American Forestry Association, Monterey, Calif.
- 20-23 National Association of Biology Teachers, Inc., Anaheim, Calif.
- 25-29 American Horticultural Society Conference, Pasadena, Calif.
- 27-28 American Association for Vocational Instructional Material, Fargo, N. Dak.
- 29-
Nov. 2 Adult Continuing Education National Conference, Detroit, Mich.
- 31-
Nov. 2 American Association of State Highway and Transportation Officials, Atlantic City, N.J.

November

- 6-9 Irrigation Association Convention, New Orleans, La.
- 7-9 Geological Society of America, Seattle, Wash.
- 8-11 Future Farmers of America, Kansas City, Mo.
- 13-16 National Forest Products Association, San Diego, Calif.
- 13-17 American Institute of Chemical Engineers, New York, N.Y.
- 13-18 American Society of Agronomy, Los Angeles, Calif.
- 13-18 Soil Science Society of America, Los Angeles, Calif.
- 14-22 The National Grange, Greensboro, N.C.
- 15-16 Purdue Air Quality Conference and Exhibition, Indianapolis, Ind.
- 22-26 National Council for Geographic Education, St. Louis, Mo.
- 29-
Dec. 1 Western Forestry and Conservation Association Conference, Seattle, Wash.
- 30-
Dec. 2 Keep America Beautiful, Inc., National Meeting, New York, N.Y.

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Exporting Conservation

From the Administrator

Technical aid may be our most valuable export to the less developed countries. Since the Foreign Assistance Act was passed in 1961, the Soil Conservation Service has sent 340 of its best people to 46 different nations to help increase crop production and protect and improve soil and water resources.

Of the 340 SCS'ers, 120 accepted resident assignments of a year or more and 220 went on short-term assignments ranging from a week to 6 months.

Today our foreign assignments continue, and we expect their numbers to increase in the near future. In making both short-term and resident assignments, we look for the best qualified people we can find. Foreign assignments are part of the career development program of the Service. We are apt to fill them with people in their middle years who understand that meeting the challenge of an overseas assignment can prepare an employee for a more responsible job at home.

It has been said, only partly in jest, that the ideal SCS candidate for a foreign assignment is a vigorous 35-year-old with 50 years of conservation experience.

SCS people who go to other countries report that they learn as many lessons as the people they help. One SCS veteran of a Latin American assignment recalled the shock of being plunged into a totally new environment, one where farmers still relied on the ax and machete instead of the tractor and combine.

He said that he found he had moved "from a place where I knew where to find most of the answers to a place where the answers had to be improvised." He also discovered that he was wrestling with resource problems that couldn't be solved by the addition of more capital and machinery. Answers had to be geared to local customs and the limits of the economy. This is valuable training for any American.

SCS also is acting as host for many foreign visitors. Since 1962, our agency has provided training for some 5,800 foreign participants from 100 countries. The trainees see for themselves whether the practices we recommend work or not and take back the information to their own people. In this way, we also are exporting American expertise in conservation.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Washington, D.C. 20402

Cover:

Texas grain sorghum farmers leave a cover of stubble during harvest to protect the land against wind erosion. (See pages 4 through 10.)

Soil Conservation

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Like a scene from a Hollywood western, three generations of Texas ranch family ride across their property, improved under Great Plains Conservation Program.



The head of the SCS program in the Lone Star State tells how a staff of 1,600 helps everybody from a citrus farmer with 15 acres to a cattle rancher with some 200,000 acres.

by George C. Marks

Texas Tales of Conservation

It's hard, if not impossible, to talk about soil conservation in Texas without talking in terms of bigness. We've got a lot of soil to conserve.

As the late Speaker of the House Sam Rayburn said after a former territory on the Arctic Circle was admitted to statehood, "Texas is still our largest unfrozen State."

But even a Texan has to admit that bigness is not necessarily an advantage in managing a conservation program. Sheer distances can wear you out. It is 601 miles from the SCS State office at Temple, in central Texas, to El Paso in the west. It is 523 miles to Dalhart, in the Panhandle. Our area office in Amarillo is closer to four other State offices than it is to ours (Stillwater, Okla.; Denver, Colo.; Albuquerque, N. Mex.; and Salina, Kans.).

The SCS district conservationist in

El Paso, J. W. McDonald, once got a wire from his brother in Chicago: "Please go to Texarkana. Help Aunt Sarah settle uncle's estate." J. W. wired back: "Go yourself. You are closer."

Few people on the State office staff have ever been to all 25 area offices in Texas. I know of only one staffer who has been to all 257 field offices. The State is so big that we've had to divide it into three administrative sections to manage it—central, north, and south.

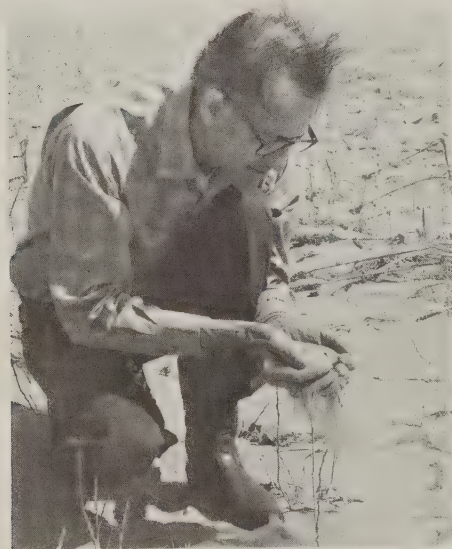
We like our employees to move around in Texas to broaden their experience. Seldom do we promote a person to a job in the same area in which he has been working. But sometimes it's like moving him to another planet.

Not long ago, for example, G. L. Westmoreland was district conser-

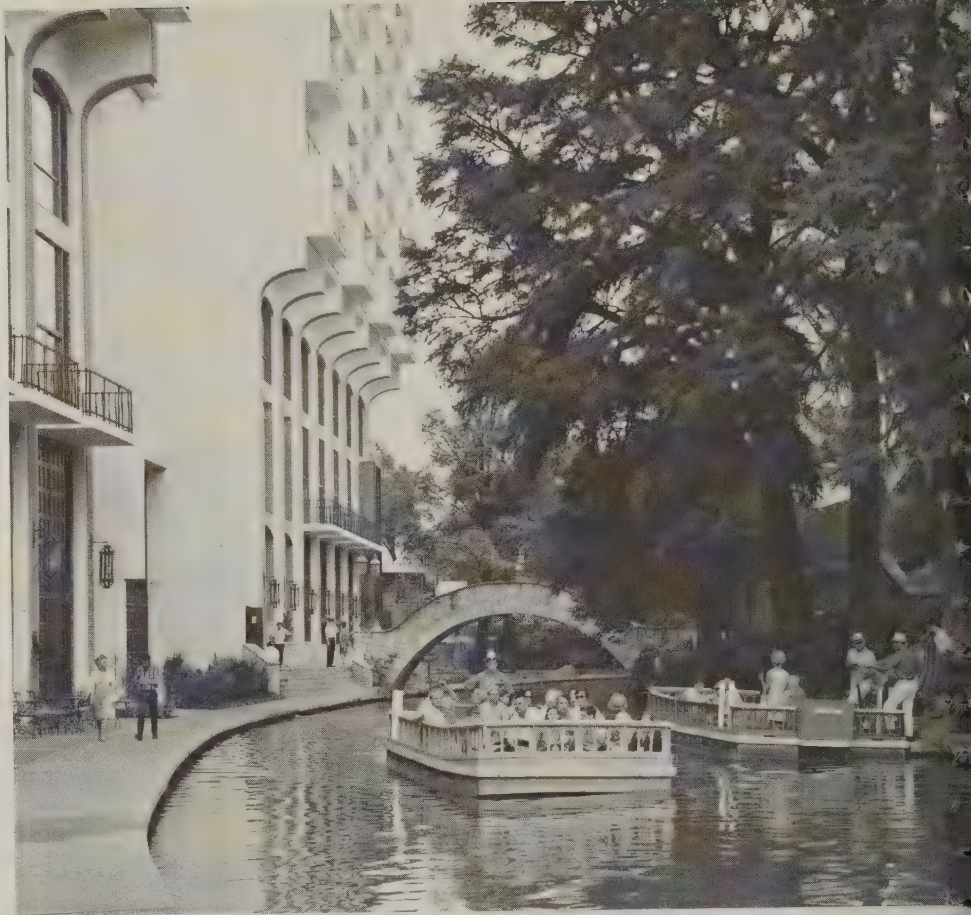
The Great Plains Conservation Program has spurred us to develop the technology needed to plan and install new conservation systems that were unheard of 20 years ago.

Attracting tourists and homefolks is the San Antonio River flowing through downtown San Antonio. It is fed from the Edwards Underground Reservoir, which also furnishes water for the city. Farm and ranch conservation slow runoff and help put more water into the reservoir.

Brush removed in strips, with cleared areas seeded to grass, improves rangeland while leaving adequate cover for deer, quail, wild turkey, and javelina. Pattern brush control was developed in Texas.



Drought still plagues the Texas Plains periodically. Walter Bertsch, SCS district conservationist at Seminole, examines the dry soils of Gaines County. Residue left on fields slows erosion.



vationist at Beaumont, serving a rice farming area along the Gulf Coast. Then we moved him 680 miles to Panhandle, a small town in northwest Texas. Rainfall dropped from 55 inches at Beaumont to 22 inches on the Plains. The average annual growing season dropped from 297 days to 197. And there are a few other differences that G. L. could tell you about!

For one thing, the weather up there is what Texans call "variable." Natives tell about the settler driving his team of oxen across the Panhandle. It was autumn, but still so hot that one ox was overcome and died. While the settler was skinning it, a blue norther blew in and froze the other ox to death.

Texas is also big in the number and quality of the people who work on soil

conservation. Our State gets nearly 10 percent of all SCS funds and has nearly 10 percent of all SCS employees. Our work force now numbers about 1,600 full-time, intermittent, and part-time employees, plus some 50 student trainees.

SCS, of course, is only part of the Lone Star conservation team. There are 197 soil and water conservation districts governed by 985 directors. The Texas State Soil and Water Conservation Board, also in Temple, includes 20 employees besides Executive Director Harvey Davis. Its annual budget is about \$1.2 million.

The rest of the conservation team—and the most important part—is made up of the 186,000 farmers and ranchers in Texas. The majority of them

While parts of Texas were suffering from dust storms last spring, other parts were battling floodwaters. To help reduce flooding, we have built some 1,800 floodwater retarding dams, sediment control structures, and grade stabilization structures.

Texas isn't all cattle, cowboys, and oil wells. A terraced field of oats awaits combining in the Red River Valley.



are soil conservation district cooperators.

The size of their operations ranges all over the map. In the Lower Rio Grande Valley, at Mission, SCS District Conservationist Norman Bade works with 3,000 farmers with an average of only 15 acres per farm. (They are interested mostly in more efficient irrigation methods, land leveling, and conservation cropping systems.)

A short drive north of the valley is the 1 million-acre King Ranch, which sprawls over two counties. Texas has some 50 ranches of more than 200,000 acres, including the 6666 Ranch at Guthrie. The "Four Sixes" supposedly got its name in the late 1800's to commemorate the draw poker hand that the new owner was

holding when he won the ranch. (Common conservation practices on rangeland include brush management, planned grazing systems, range seeding, livestock water development, and ponds.)

SCS has defined 20 land resource regions in the 48 contiguous States. Each is sharply different from the others in land use, topography, climate, water, and soil. Most States have only one or two such regions; Florida has three. There are six regions, however, located in whole or in part in Texas. There also are 705 recognized soil series in the State. It's enough to drive a soil scientist nuts!

Crazy or not, scientists have completed soil surveys on 77 percent of the State. Of the 25 Standard Met-

ropolitan Statistical Areas in this supposedly rural State, all have been mapped with a very few exceptions.

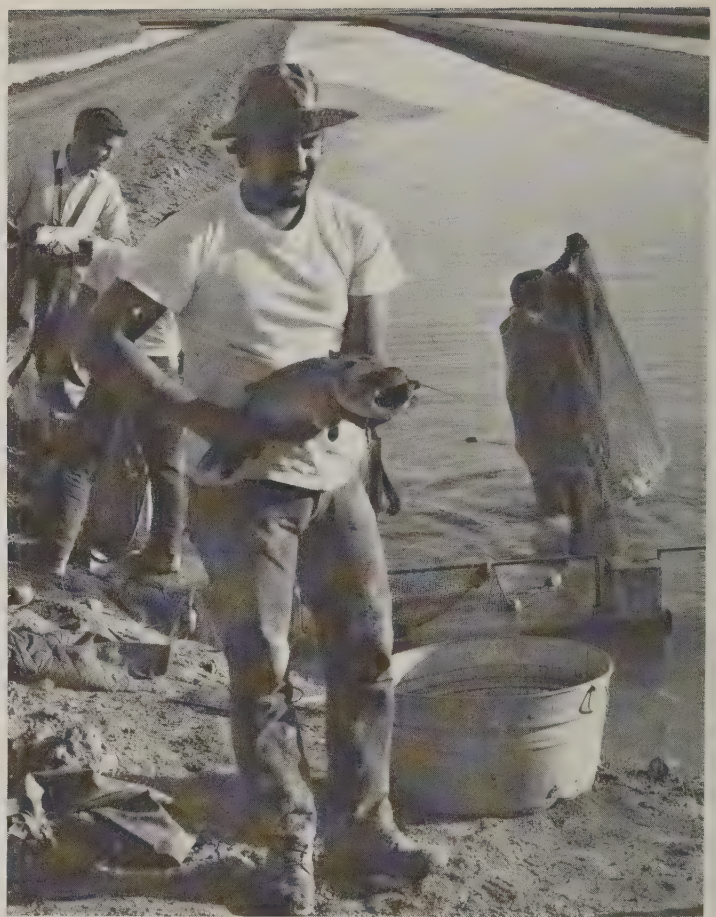
As you might expect, we've pioneered several conservation practices in Texas. One is pattern brush control, in which the rancher clears strips of brush and plants them to grass, leaving alternating strips in woody plants for wildlife cover. Done properly, the practice can improve habitat for most wildlife species.

We also developed short duration grazing, in which livestock from several pastures are grouped into a single herd and placed in one pasture. After a few weeks, they are rotated to another pasture. The first pasture is rested to allow the better grasses to gain in vigor, produce seed, and thicken the stand; and so on, through a number of pastures. The system is complicated and takes careful management, but some 400 Texas livestock producers are now using short duration grazing with good results.

We also install a lot of terraces and grassed waterways. Lately we've been

Texas is big in the number and quality of the people who work on soil conservation. But SCS is only part of the Lone Star conservation team. There are 197 soil and water conservation districts governed by 985 directors.

Ten-pound channel catfish is moved from one raceway to another at the Big River Catfish Farms, in Maverick County. SCS technicians helped with design and layout of raceways.



Near Mission, land is leveled between rows of citrus trees for better irrigation water management. This is a common practice in subtropical Lower Rio Grande Valley.



Texas is still the Nation's number one cattle State, with no other State even threatening to steal that position. Herefords were described by field photographer as "high-class cattle on high-class range."

We emphasize operations management down here, partly because we want to give sound advice and service, and partly because that's the kind of service that Texans demand.

building about 4,300 miles of terraces per year. That's enough to reach from Texas to Alaska—and back. Our records show that some 274,000 miles of terraces are "on the land" in Texas. That's enough to reach to the moon, with 35,000 miles left over.

This is not to say that we have built all the terraces we need, because we haven't. Our last conservation needs inventory showed that some 5.3 million acres of cropland needed terracing.

We also have more work to do in the Southern High Plains. Wind erosion this year damaged more than 2 million acres in west Texas. A lot of the damage occurred on March 11, when winds gusting up to 100 miles per hour raked the dry-as-dust soils. Even irrigated wheat blew out of the ground near the Texas-Oklahoma border. And while I can't vouch for it personally, a farmer said he saw a hen backed into the wind lay the same egg four times.

The storms brought back grim memories of the 1933 Dust Bowl, when Texas children wore gauze masks to prevent "dust pneumonia" and a



Nearly half the terraces built in Texas today are parallel, like these seven in Gonzales County. They are easier to farm with modern equipment than old-style terraces.

A rancher in Pedernales County waters his horse (and dog) at a concrete watering tank built to take advantage of a spring seep in the limestone hills.

Panhandle editor couldn't see across Main Street for 27 days out of 31.

But conditions this year were not nearly as bad as in the dirty thirties, thanks to the work of districts, SCS, and conservation farmers. Over the years, they have learned how to tie down the Plains soils with minimum tillage, stubble mulching, and other practices. Not everyone uses them yet, but the number increases each year.

The Great Plains Conservation Program also has helped. Texas has 123 counties in the program and farmers and ranchers have signed more than 15,000 contracts on 19.2 million acres. The program also has spurred us to develop the technology needed to plan and install new conservation systems that were unheard of 20 years ago. These include minimum tillage, parallel terraces, certain types of critical area treatment, and short duration grazing systems.

We also have new conservation and forage plants; some of them are selected and released by the plant materials center at Knox City, Tex. The

most successful Texas selection so far is a warm season grass from South Africa, Selection 75 kleingrass. This grass is excellent forage; it gets green early and stays green late, and it tolerates drought and moderate salinity. Texans have planted a lot of it since SCS released it.

While parts of Texas were suffering from dust storms last spring, other parts of the State were battling floodwaters. To help reduce flooding, we have built some 1,800 floodwater retarding dams, sediment control structures, and grade stabilization structures. The work has been done through all three watershed protection programs: authorized watersheds, the pilot watershed program, and Public Law 566.

And there is still more to do, as recent flood victims can testify.

The size of our State doesn't mean that Texans aren't also concerned with the smaller things in life. Many of our citizens are worried, for example, about preserving the rare golden-cheeked warbler. This songbird builds its nests only from the loose bark it strips from mature juniper trees found in the Texas Hill Country. The birds migrate there from Mexico every spring.

The trouble is, large acreages of virgin juniper have been cut for fenceposts and aromatic oils. The destruction of the warbler's habitat has gradually reduced its numbers, but now our citizens are determined to reverse the situation. One rancher near San Antonio has cleared his land of the small junipers of no benefit to the warblers, and kept the bigger trees as well as associated oaks that

We've pioneered several conservation practices in Texas. One is pattern brush control; another is short duration grazing. We also install a lot of terraces and grassed waterways.



Riceland along Texas Gulf is leveled under water. Sediment suspended in the water settles out evenly.

furnish cover for the birds. His personal wildlife preservation program has been carried out on several hundred acres, all for the specific benefit of the golden-cheeked warbler.

It takes all kinds to make a well-rounded conservation program, and we have them all in Texas. Texans have character . . . and they *are* characters. And they take their independence and individuality—and conservation—seriously. We put a lot of emphasis on operations management down here, partly because we want to give sound advice and service, and partly because that's the kind of service that Texans demand.

For that reason, Texas is good training ground for soil conservationists. If Virginia is the Mother of Presidents,

then Texas is the Mother of State Conservationists. Besides me, seven of the present SCS State heads worked and learned here. We also have several alumni in the Washington office, including an assistant administrator.

Nearly 500 Texas Aggies (graduates of Texas A&M University) work for SCS, including me. Their numbers include the Aggie range conservationist who stopped by the butcher shop the other day to buy a dozen karate chops.

With employees like that, we know Texas is in good hands.

Mr. Marks is State conservationist,
SCS, Temple, Tex.

Over the years, farmers and ranchers have learned how to tie down the soil with minimum tillage, stubble mulching, and other practices. Not everyone uses them yet, but the number increases each year.

Miniature soil profiles were popular mementos of the Scout Jamboree. SCS District Conservationist Michael Sigrist from Salisbury, Md., explains the natural processes of soil development while the Scout uses materials representing bedrock, parent material, subsoil, and surface soil to create a soil profile in a plastic tube.



by Thomas W. Levermann

Conservation Is Your Future

Backyard conservation was one of many displays giving Boy Scouts an opportunity to learn about soil and water conservation at the 9th National Scout Jamboree.

A model backyard shows Scouts conservation techniques they can use at home, such as good ground cover to protect the soil. Water from an underground seep is drained into a small pond which provides water for birds and other wildlife. To prevent running water from eroding the soil at the drain outlet, the waterway is lined with rocks.

District Conservationist Byron Breisch of Butler, Pa., discusses plants that wildlife use for food and cover and that Scouts can plant in their own yards.



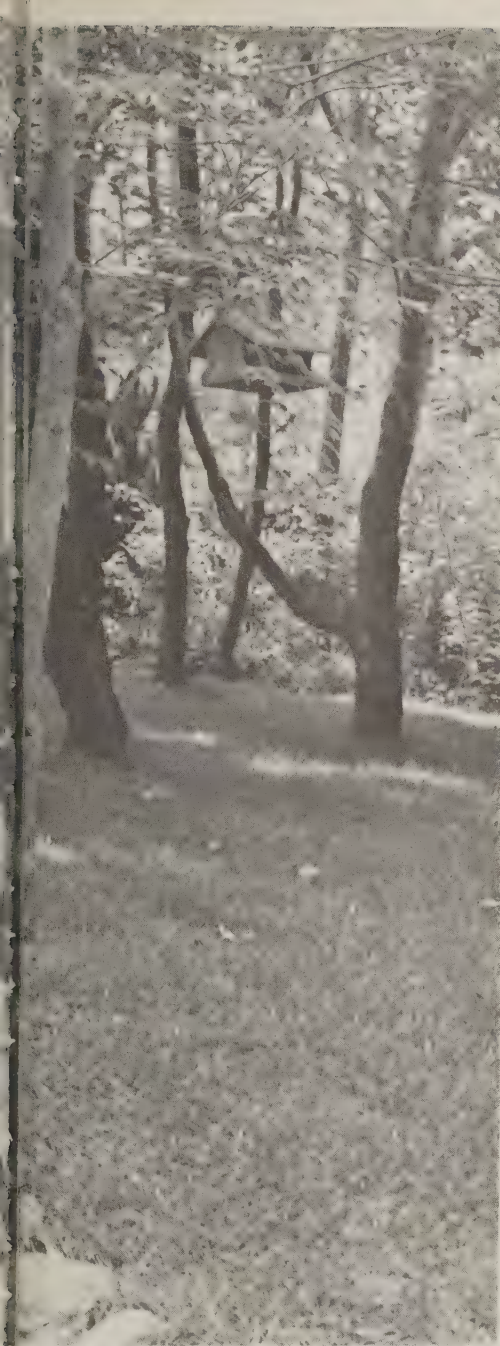
"Comparing the backyards and making a soil profile were two of the best experiences I've had all week," exclaimed an enthusiastic California Scout at the 9th National Scout Jamboree. Hands-on learning activities and demonstrations of conservation problems and solutions highlighted the 3-acre Soil Conservation Service instructional area.

"Conservation Is Your Future" was the theme for the SCS conservation program, a part of the Jamboree's 80-acre environmental conservation

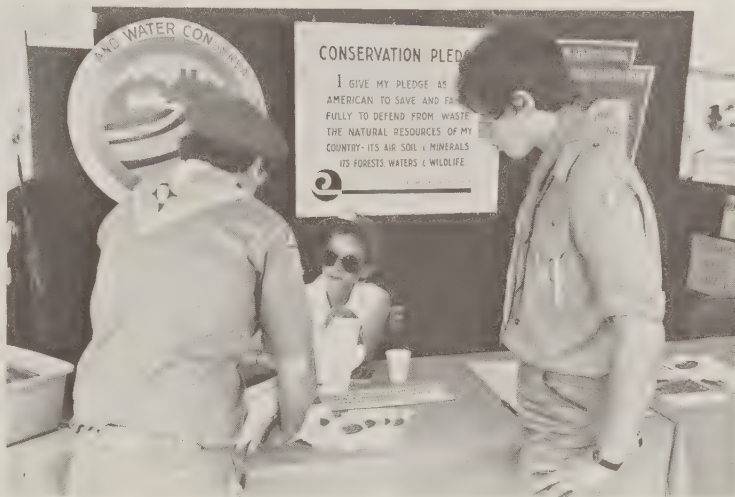
learning area. SCS was one of 24 State and Federal agencies and private conservation organizations that constructed special displays and conducted continuous conservation learning programs in the area.

Two model backyards constructed by SCS highlighted for Scouts and visitors the benefits of conservation of soil and water. The yards contrasted the effects of poor use of natural resources with an inviting homesite that had been improved through the use of simple and inexpensive conservation

Photos, Donald C. Schuhart



Butler County Conservation District Director Jean Breisch gives Scouts information about earning the soil and water conservation merit badge. Scouts who earn the badge after they return home and have it certified by a local conservation district official will receive a specially designed patch from Butler District.



Scouts study monoliths of six different Pennsylvania soils and photographs of good and poor uses of those soils. District Conservationist Ronald Phelps from Somerset, Pa., explains how to relate different soil characteristics to appropriate land uses.

techniques. In the "conservation" backyard, practices such as plantings to attract wildlife and add beauty, composting, and a waterway lined with rocks illustrated conservation projects Scouts could tackle at home. The other yard depicted the consequences of neglect: rills and gullies, soggy spots where grass would not grow, and effluent from a waste disposal system functioning improperly because of poor surface water management.

Other sections of the SCS "Conservation Is Your Future" area gave

Scouts opportunities to learn how and why erosion occurs and what can be done to control it; the relation of soil characteristics to good land use; how soil is formed; how surface-mined land is reclaimed; and something about significant soil-water-plant-animal relationships. Each demonstration at the instruction stations offered ideas that Scouts could adapt for environmental improvement projects in their home communities.

SCS also created a one-third scale model conservation camping area

showing how to protect natural resources on troop campsites from overuse. The on-the-ground exhibit explained a simple method of rotating campsites over a 3-year period based on the characteristics and capabilities of the soil.

More than 28,000 Scouts and leaders from the 50 States and 22 foreign countries attended the Jamboree, which was held at Moraine State Park in Butler County, Pa., about 50 miles north of Pittsburgh.

Scouts also visited the Jamboree



In the SCS learning area at the Jamboree, RC&D Coordinator David Hinson from Canfield, Ohio, describes a mural showing various events occurring in the area of Moraine State Park during the last 15,000 years. Some of the scenes depict the advance of the last glacier and the process of soil formation, the effects of coal mining on the environment, and how Pennsylvanians have reclaimed the mined land for a park.



District Conservationist Timothy Emenheiser from Hollidaysburg, Pa., helps Scouts demonstrate the effect of falling water on bare soil and soil protected by grass or mulch. Scouts see that a vegetative cover reduces soil erosion and improves water quality.

Merit Badge Midway where the Butler County Conservation District made a significant contribution in encouraging Scouts to learn about soil and water conservation. There, district directors and employees instructed Scouts on how to earn the Scout soil and water conservation merit badge. After a Scout earns the merit badge and a district official in the home community certifies that it was earned, the Butler district will send the Scout a special conservation patch. The National Association of Conservation Districts

shared the cost of special leaflets about conservation districts that were given to each Scout.

Mr. Levermann is an educational relations specialist, Information Division, SCS, Washington, D.C.

Keeping Dairy Waste Under Control

by Anne Schuhart

Pollution problems caused by topography on Lloyd and Vernon Garzoli's farm are typical. Runoff from the hills washes manure into a stream.



Dairy farmers faced with meeting water quality requirements sought help in designing waste management systems.

On the McClelland's dairy farm, waste passes through three settling ponds. At right, when the first is full, the liquid overflows into a second pond then into a third (below). Because of the drought, the third settling pond has not had enough water to make the flushing system fully operational.



Robert McClelland and his son, George (right), discuss their waste disposal system with Kenneth Wingett (left), SCS soil conservation technician. Liquid waste is recycled to flush barns or irrigate and fertilize corn grown for silage. Solids are spread on fields.





Lloyd Garzoli (left) and his brother, Vernon, use tractor power to pump slurry to fields through a pipeline and sprinkler system. A sprinkler sprays slurry onto the Garzoli's pastures to irrigate and fertilize the grass.

Californians are working together to keep animal waste from polluting San Francisco Bay, Tomalas Bay, and the Pacific Ocean.

Since the late 1960's, California has had one of the strongest water quality control programs in the Nation. A State board along with regional boards established water quality standards, adopt and enforce waste discharge orders, and administer the Federal Water Pollution Control Act Amendments of 1972.

In an area north of San Francisco, two counties and five resource conservation districts are coordinating their work with two regional water quality control boards in an effort to clean up the water.

Much of the work of regional water quality boards involves municipal and industrial wastes. But in Marin and Sonoma Counties, where dairying is a major agricultural enterprise, the San Francisco Bay Area and North Coast Regional Boards ran into another problem: Animal waste and washwater from dairies was contributing to the pollution of local municipal water supplies and several Tomalas Bay oyster farms.

The regional boards set tight deadlines for meeting water quality requirements: September 1976 for dairies draining into Tomalas Bay and September 1978 for other dairies in the Bay Area and North Coast Regions. However, many dairy farmers could not afford waste management systems to meet the requirements. Some systems could cost as much as

\$300,000—or \$450 per cow—including freestall loafing barns.

Dairy waste committees, under direction of the Farm Bureau and working closely with the Cooperative Extension Service Farm Advisors for Marin and Sonoma Counties, requested special help in meeting the requirements from the Soil Conservation Service and the five resource conservation districts in the counties. Through the Intergovernmental Personnel Act (IPA), Marin County in 1973 hired an SCS agricultural engineer to design waste disposal systems for dairies and help farmers plan management of the systems. The next year, Sonoma County hired an SCS engineer and a technician through IPA agreements to help dairy farmers.

Marin County further decided to pay 25 percent of the cost of the systems in five equal annual installments.

"In Marin County, across the Golden Gate Bridge from San Francisco, many of the residents are strong environmentalists, and their attitude has helped. The county decided to help farmers financially partly because dairies provide open space in the rapidly urbanizing area," explained Rixon Rafter, the SCS engineer assigned to the county from 1973 to 1976. Rafter now is assigned to Sonoma County, and Marin County has hired a private consulting engineer to complete the work begun under the IPA Agreement.

The regional water quality boards oversee the program, and the districts and SCS continue to work with the

farmers on management after the systems are installed.

"Designing and managing self-contained systems is tough here because many of the dairies are on hill-sides along creeks that flow into urban areas," Rafter said.

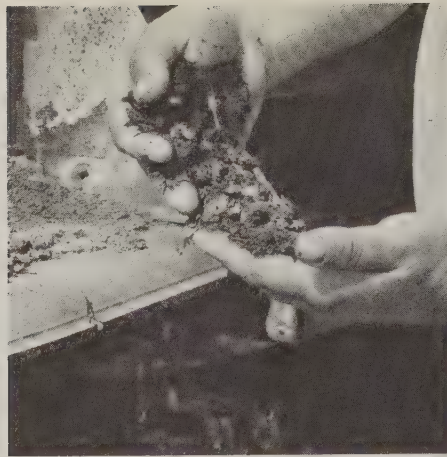
The problems caused by topography on Lloyd and Vernon Garzoli's farm southwest of Petaluma are typical. The dairy has been in the Garzoli family for 90 years. As on many old farms, the feeding, loafing, and milking areas are on steep hills sloping down to a small creek. Each rainfall washed manure into the stream.

The Garzoli brothers began recycling animal waste on their own about 6 years ago. In Sonoma County, they were among the first to pump liquid waste through a pipeline and sprinkler system onto pastures.

"We had no guidelines for recycling waste," said Vernon Garzoli, "so we just went ahead with what we thought would work."

Their new plan of operations, drawn up by Rafter in April, incorporates the Garzolis' ideas. Animal waste, washwater, and runoff—"slurry"—still will be transported and spread onto pastures by the pipeline and sprinkler system or by truck. Waste from an open feeding area will be scraped up and also spread on pastures. The plan details how much waste can be applied to the land without danger of pollution.

The Garzoli brothers now are excavating a large holding pond to store waste and runoff from a feeding area, loafing sheds, and a corral. They also



On Arthur LaFranchi's farm, dried manure is spread on pastures or used as bedding in the freestall barn.

are building a network of diversions and culverts to conduct clean runoff from the hillsides and rooftops around and under manured areas and into the stream.

Robert McClelland and his son, George, installed a different type of waste disposal system for their dairy west of Petaluma. Waste is flushed from the feeding and freestall barns into a concrete holding tank and pumped from the tank into a settling pond. When that pond is full, the liquid is allowed to overflow into a second settling pond and then into a third. When it has passed through all three ponds and the solids have settled out, the liquid is piped into a storage pond. It is recycled to flush the barns or to irrigate and fertilize corn grown for silage.

The plan specifies that solids will be removed from the settling ponds once a year and spread on fields. Open corrals will be scraped before winter rains, and the solids also will be spread on fields. To avoid polluting runoff, the corrals will not be used in winter.

Arthur LaFranchi's dairy had severe pollution problems because the drainage flowed through the nearby city of Petaluma. Last November, he moved his 650-cow milking herd into new quarters on another ranch northwest of Santa Rosa. A self-contained waste management system was designed into the operation from the beginning.

The new dairy has no open corrals; milk cows are housed in freestall loafing barns instead. Freestall loafing

barns are replacing open corrals in the dairy industry because they increase milk production by protecting the cattle during heavy rains or hot weather. The barns help control pollution because the roof keeps rain from falling on the manured area and washing waste into waterways.

Like the McClellands, LaFranchi flushes waste from his concrete barn floors. LaFranchi, however, then uses a drag chain type separator to remove the solids from the manure-water mixture.

The solids are stacked, dried, and used as bedding in the freestall barn or spread on pastures. The liquid is collected in a holding pond and used to irrigate cultivated fields of winter oats and summer corn grown for silage.

Bob Fistolera, LaFranchi's head herdsman, said, "This flushing system is much easier. We used to scrape up the manure while it was still wet. It was miserable for the animals and miserable for the people who had to do it."

Nevertheless, flushing systems have drawbacks as well, and this year's lack of water is one of the dairymen's biggest problems.

"If we had stayed in Petaluma, we'd have been out of business because of the drought," Fistolera explained. "It hasn't hurt us much here because we use effluent from Santa Rosa's municipal disposal plant for irrigating pastures and we have three wells for fresh water and flushing."

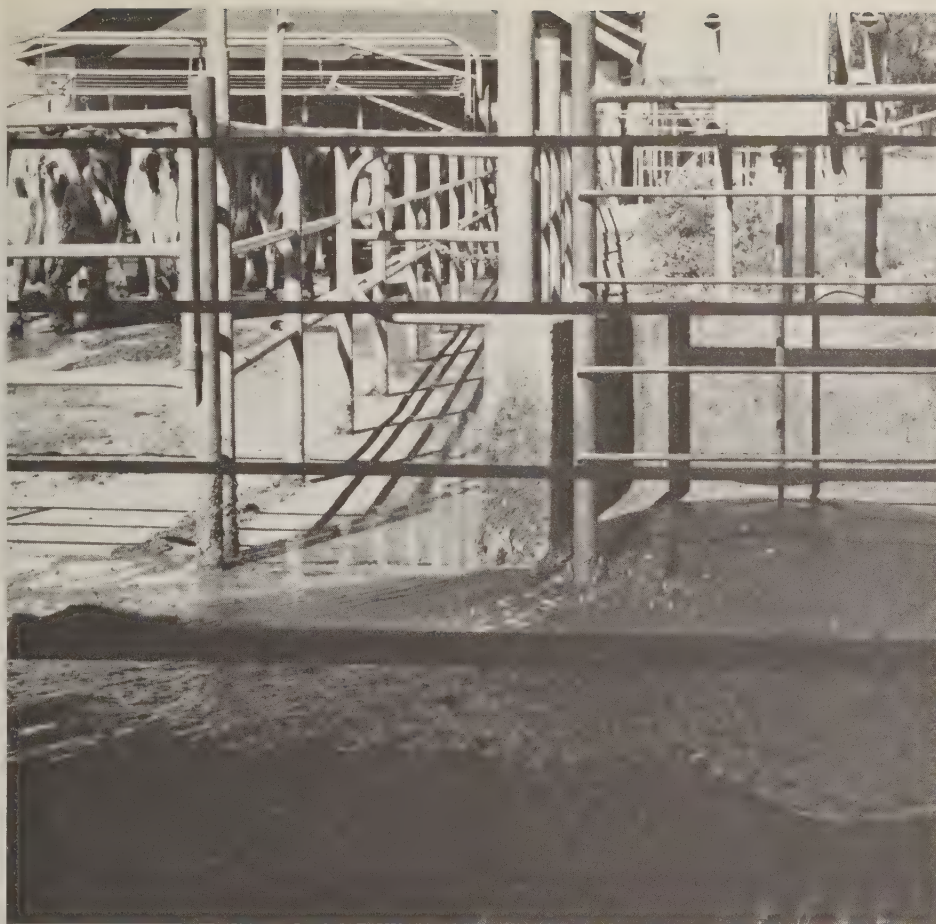
The drought is slowing Robert and George McClelland; however, Al-

though they completed construction on their waste disposal system this spring, they are running short of water to make it work. It takes nearly 100,000 gallons of water a day to flush the four concrete alleys in the loafing barn.

The drought also is hurting dairymen throughout the area financially. Milk cows, which usually graze in spring and early summer, had to be put back on feed in April or May. Young and dry stock, which usually graze year round, also must be fed now. Many stockwater ponds and wells are drying up, and many farmers in both Marin and Sonoma Counties are hauling water for their animals and for sanitation. Partly because of the drought, some dairies in the area have been forced out of business altogether.

In spite of the lack of water and increased expenses, however, more than 80 percent of the dairies in Marin County and 90 percent of the dairies in Sonoma County have completed waste disposal systems or are working toward compliance with the water quality standards. Pollution from dairies soon will be stopped by the cooperative effort.

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.



In LaFranchi's system, water released at one end of the freestall barn (top) flushes waste into a pit at the other end (bottom).



A drag chain separator removes solid waste from the liquid in the pit. The liquid is collected in a holding pond and used to irrigate fields.



Through community cooperation, a rural Alabama town rescued a schoolyard that had severe erosion problems.

Playground Minus Gullies

"Grass on the schoolyard at Butler Elementary? It'll never grow there," said local skeptics when conservation planning began at the school last year.

A preliminary survey of the school site in rural Choctaw County, Ala., was not encouraging. About a fourth of the playground was severely gullied and the usable part had only about a 10 percent grass cover.

Because the school is surrounded by a residential area, there is no room to extend playgrounds. Intensive use by more than 850 students over the years had aggravated erosion problems that were caused partly by the 8-degree slope of the land. Several portable and temporary classrooms further crowded the area.

Sediment from the schoolyard washed into a small stream nearby, reducing its water capacity. Consequently, the stream flooded with almost every rainstorm, sometimes causing wet basements in a few nearby homes.

The Butler Parent-Teacher Association (PTA) Special Projects Committee asked for help from the Soil Conservation Service through the Choctaw County Soil and Water Conservation District. Working through the district, SCS prepared a conservation plan for the site.

Mirian Heaton, principal of the school, backed the conservation plan. Many of the teachers used the planning stages of the project as an opportunity to help students understand conservation practices and how people can improve their environment.

Cost estimates included in the plan far exceeded funds available from the PTA, but Heaton was determined to have the playground improved before the next school year.

Community cooperation was the answer. Support from county officials, businessmen, and parents eventually solved most of the money problems.

County Commissioner J. K. Sparrow sent a bulldozer and roadscraper from his road crew to smooth off the gullied areas, thus saving several thousand dollars. The city of Butler supplied a

backhoe and operator for excavation.

Probate Judge-elect Charles Ford donated his time and equipment for disking and preparing the seedbed for grass. A local merchant donated 50 pounds of Pensacola bahiagrass seed and sold bermudagrass seed to the PTA at a reduced price.

Another county commissioner, Grady Mosely, hauled topsoil to cover 3 acres, replacing the soil that had washed into the stream. Parents and students helped mulch the 3 acres by hand.

A third county commissioner, Julian Johnson, helped with a concrete flume and box outlet designed by SCS to carry off stormwater. He built the forms and supervised the pouring of concrete, saving the community much expense. The plan also included about 1,000 feet of diversion terraces.

The surface water disposal system was barely in place when it was severely tested. A rainstorm dropped 2.5 inches of rain within an hour and a half. The system worked; only minor damage was done to one diversion. The system carried water safely off the schoolyard and not a single basement was flooded.

As the grass began to grow, the skeptics took another look.

Seeding on the rest of the schoolyard was put off until summer vacation. In the fall, students will begin revegetating small plots around the main playground. Later, they will establish study sites in the schoolyard.

Butler school is a shining example to other schools in Choctaw County. Two more schools have already asked SCS to help them solve their schoolyard problems.

The Butler project proved that local effort can do the job—no Federal or State funds were used. The cost estimate for shaping and planting the school site was \$10,000. Thanks to community cooperation, it cost less than \$4,000.

Mr. Donaldson is district conservationist, SCS, Ozark, Ala.



Butler Elementary School Principal Mirian Heaton inspects a good stand of grass where there was only a 10 percent cover.



Gullies on the playground at Butler school were unsightly and dangerous. Through a community effort, the eroding areas were smoothed, shaped, and seeded.

Terraces Do the Job

An agricultural magazine editor tells how a young Idaho farmer evaluates soil and water conservation practices.

by Gale Chambers

In Idaho, farmers use diversion terraces along with other conservation practices to stop erosion.



There are times when a severe storm can boil the silt out of the cropped farms and foothills in and around Rockland, a dryland wheat growing region in Power County, Idaho. In the past, soil losses have been estimated at 20 tons per acre annually. Soil conservation Service specialists have estimated the loss in the entire Rock Creek watershed area at nearly 2 million tons with some 550,000 tons reaching the Snake River. The rest of the silt is deposited on the bottomlands along Rock Creek.

It's good soil, and good soil can erode.

Not every farmer in that basin is content to watch the soil wash down the creek; some of them are fighting to keep it on the land.

Stanford Taysom, a young dryland wheat farmer, looks at farming as a stewardship role rather than an owner role.

"I believe we have an obligation to the land," says Taysom, as he struggles to keep the soil attached to his deed.

There are a lot of good soil conservation practices that farmers can use in their battle with erosion. Taysom's stock in trade is his ability to mesh a good practice with farming practicality. He not only believes in establishing a good terrace system; he works to find a manageable way to put it in. He serves as his own contractor and builds his own terraces.

It's one thing to put in a terrace storybook-style; it's another to be able to farm over those terraces once they are in. "It's definitely a give and take operation," said Jim Stalnaker, SCS district conservationist. The important thing, according to Stalnaker, is that terraces are being constructed and being dovetailed into other conservation practices.

According to Taysom, fitting conservation practices into a farm management scheme isn't hard to do. One has to know which practice is time consuming and which is timesaving. An eroding gully may eventually cost the farmer time because he has to maneuver his equipment around it. Gully plugs and terraces can save time. However, the establishment of terraces on a field with no eroding gully may cost the farmer time because he'll

have to farm over and around the terrace.

Taysom timed his work effort on a field that was not eroding badly. It took him 10½ hours to work the field. Then he put in terraces and reworked the same field. He found that it took him 15 minutes longer to cover the same area of ground. The extra 15 minutes isn't too much to keep erosion on the field under control.

A common complaint of terraces is that they rob the grower of potential yield because of disturbed soil. "You may lose some yield on the upper end of the slope, but you'll pick it up below the terrace due to seepage and moisture through the terraces. This additional moisture will boost yield in that spot—so it'll balance out," Taysom said.

By learning how to build his own terraces, the farmer-operator can reduce his costs. Taysom estimates that he can build his own terraces for 65 cents per linear foot, if conditions are right. So far he has installed some 38,000 linear feet of basin terraces.

"Terraces alone won't do the job," says Taysom. "They must be combined with other practices." He uses gully plugs, deep chiseling, and limited tillage to work in harmony with the terraces. "The terrace system does make an operator farm on the contour," he says. "That in itself is a conservation practice."

Slopes in Rockland Valley vary from 5 to 15 percent. Newer, more powerful equipment makes it easier for farmers to work the steeper slopes.

One of the most important things Taysom does is log his time and effort concerning terrace construction. He wants to determine how long his terraces will last; whether cost sharing is important; whether terraces are worth farming over; if they are worth the time and effort in the long run; and what the long and short range benefits are. All of these questions are going into Taysom's log book along with other information he may add concerning cost and benefits.

Mr. Chambers is editor, *Idaho Farmer-Stockman*, Boise, Idaho.

Meetings:

October

2-6	Congress for Recreation and Parks, Las Vegas, Nev.
2-6	National Association of County Agricultural Agents, Hartford, Conn.
2-7	Water Pollution Control Federation Conference, Philadelphia, Pa.
8-12	American Institute of Planners Conference, Kansas City, Mo.
14-20	National Environmental Sanitation and Maintenance Educational Conference, Exposition, Lake Buena Vista, Fla.
15-19	American Bankers Association, Houston, Tex.
16-19	American Forestry Association, Monterey, Calif.
20-23	National Association of Biology Teachers, Inc., Anaheim, Calif.
25-29	American Horticultural Society Conference, Pasadena, Calif.
27-28	American Association for Vocational Instructional Material, Fargo, N. Dak.
29-Nov. 2	Adult Continuing Education National Conference, Detroit, Mich.
31-Nov. 2	American Association of State Highway and Transportation Officials, Atlantic City, N.J.

November

6-9	Irrigation Association Convention, New Orleans, La.
7-9	Geological Society of America, Seattle, Wash.
8-11	Future Farmers of America, Kansas City, Mo.
13-16	National Forest Products Association, San Diego, Calif.
13-17	American Institute of Chemical Engineers, New York, N.Y.
13-18	American Society of Agronomy, Los Angeles, Calif.
13-18	Soil Science Society of America, Los Angeles, Calif.
14-22	The National Grange, Greensboro, N.C.
15-16	Purdue Air Quality Conference and Exhibition, Indianapolis, Ind.
22-26	National Council for Geographic Education, St. Louis, Mo.
29-Dec. 1	Western Forestry and Conservation Association Conference, Seattle, Wash.
30-Dec. 2	Keep America Beautiful, Inc., National Meeting, New York, N.Y.

December

4-6	American Society of Farm Managers and Rural Appraisers, Inc., Denver, Colo.
5-9	American Geophysical Union, San Francisco, Calif.
12-13	Erosion and Sedimentation Symposium, Chicago, Ill.
13-16	American Society of Agricultural Engineers, Chicago, Ill.

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October 1977

U.S. Department of Agriculture

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More Women Are Conservationists

From the Administrator

This month is the 10th anniversary of the Federal Women's Program and we can report that the number of women in professional positions in the Soil Conservation Service is definitely increasing.

In 1975, there were 191 women in full-time professional and administrative positions in the Service. In 1976, this number rose to 242. By the end of 1977, it will be higher still. In addition, more student trainees and cooperative students are women than ever before in our history.

SCS, of course, has never been without its valuable women employees. The majority of them, then as now, were in secretarial and clerical positions. In past years, however, several professional career ladders were not generally accessible to women. This is not the case today.

One important breakthrough for women in SCS jobs occurred about 2 years ago, during International Women's Year, when Roberta J. Stevenson became the first woman district conservationist and line officer in SCS history. Since then, four more women have been promoted to district conservationist jobs.

What is happening in SCS, of course, is happening throughout business, industry, and government. Barriers to women's employment and advancement generally are coming down in all kinds of fields that used to be the exclusive province of men.

The old excuse that certain jobs are "too rough and strenuous" for women is deadlier than a doornail, hopefully for good. Women in many cultures have traditionally done *all* the heavy work; women in agriculture, even in America, worked alongside their husbands in the field for many hours, performing work that would quickly exhaust most male American office workers today.

Also without validity is the excuse that "men don't accept advice from women." One is tempted to say that women in their role as wives have been successfully advising men for countless centuries. More to the point, however, is the fact that farmers seeking conservation assistance are only too glad to receive it from anybody—provided it is competent, knowledgeable help. In SCS, as in other enterprises, it is competence that counts, not sex or race or national background.

We are not overlooking the women who are already employees of SCS in nonprofessional positions. SCS is committed to increasing and improving their educational and training opportunities through such vehicles as the Federal Women's Program and the Upward Mobility Program.

It has been stated repeatedly in the Service that there is not a job in the organization that cannot be filled by a qualified woman. We mean it.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

With drip irrigation systems, avocado growers can plant their orchards on land too steep for traditional cultivation. See pages 8 through 14. (Photo, Donald C. Schuhart.)

Soil Conservation

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SCS women in professional positions include Sherrie K. Barham (at right), a hydraulic engineer in the Michigan State Office; E. Selden Cowan (below, top), soil survey party leader, St. Joseph County, Mich.; and Donna L. Storch (below, bottom), soil conservationist in Yakima, Wash.



An increasing number of professional women are finding career positions in the Soil Conservation Service.

Update: Women in SCS

Patricia O. MacPherson, chief of the Soil Survey Editorial Staff, Hyattsville, Md., studies a soil profile with a soil scientist from Maryland.



Joan K. Love is the first woman administrative officer in SCS.

Peg S. Whiteside is a civil engineer working out of the Superior, Wis., field office.

At last count, there were more than 1,600 women in permanent, full-time jobs in SCS, and 281 of them occupied professional, administrative, or information positions. This is over 25 percent more women than held such jobs a year earlier. An additional 65 women were employed as student trainees and 29 were participating in the cooperative education program.

It has been 2 years since Roberta J. Stevenson became the Service's first woman district conservationist, working with the Wellton-Mohawk Valley

Natural Resource Conservation District in Arizona. Since that time, four other women have been appointed to district conservationist jobs—Sheila Miller in Pennsylvania, Gail Moffitt in California, Carol Anderson in Idaho, and Miriam Bailey in North Carolina.

Another woman, E. Selden Cowan, was named soil survey party leader last June, heading a team in St. Joseph County, Mich. Her promotion followed 7 years of experience as a soil conservationist and soil scientist. Also this year, Joan K. Love became

the first woman administrative officer in SCS, in the West Technical Service Center (TSC), Portland, Oreg.

In a dozen State offices, women now serve as public information officers or specialists, and they work as information assistants in two more. Three women are upward mobility trainees on TSC field information staffs.

In the Washington office, there are 19 women in professional editing and writing positions. They include Patricia MacPherson, who heads the soil survey editorial staff; Charlotte Colton,



Miriam G. Bailey was a soil conservationist before she became district conservationist in Sanford, N.C., in April 1977.

head of the general publications unit; Shirley Fields, who handles radio and television news; and Judith Ladd, editor of *Soil Conservation* magazine.

Also in key jobs in Washington are Sally Schauman, landscape architect; Ida Cuthbertson, community planner; Kay Mergen, educational relations specialist; Eleanor Wilson, personnel staffing specialist; Shirley Elliott, program analyst; and Ruby Gill, computer specialist.

Servicewide, women today are working as agricultural and civil engineers,

range conservationists, and soil scientists. Some 56 are soil conservationists. In nonprofessional technical positions, 53 women have cartographic jobs, 5 are engineering draftsmen, 6 are biological technicians, and 1 is a construction inspector.

The increased number of women in SCS is evidence of women's growing commitment to jobs outside the home. In 1950, there were only 18 million women working or seeking work. In 1976, there were more than 38 million women over age 16 in the civilian labor



At right, Sheila M. Miller, district conservationist, Clarks Summit, Pa., discusses conservation plan with a cooperator. Below, Gail T. Moffitt is district conservationist, Colusa, Calif.



force—more than 40 percent of the total.

According to projections, by 1990, more than 48 million women will be working, making up nearly half the work force. Many more will be in jobs related to agriculture; some 28 percent of the 97,727 students enrolled in agricultural schools during 1976-77 were women.

Another factor in the brighter job picture for women is the growing influence of the Federal Women's Program (FWP). Created by Presidential Execu-

Top, before becoming the district conservationist in Meridian, Idaho, Carol A. Anderson worked as a resource conservationist.

Bottom, Roberta J. Stevenson, Wellton, Ariz., is the first woman district conservationist.



On the Lighter Side

by Carol A. Anderson

It is in the field, as every Soil Conservation Service employee knows, where all the important "action" takes place.

The job of district conservationist (DC), besides being very interesting and enjoyable, also has its share of humorous, memorable moments.

I had been the DC in Ada County, Idaho, for only a short time when I went to the State prison farm for a meeting on a revision of the farm's conservation plan. As I prepared to leave the compound afterwards, the gate wouldn't open. I nearly tore it off the hinges in my panic before the guard in the tower pressed a button to let me out.

A 65-year-old farmer told me to be sure and tell his wife I'm from SCS when I call so she won't think I'm his girl friend.

The State information specialist accompanied me to a farm for a session on conservation planning. The landowner's dog attacked her three times before the owner dragged him away and locked him up.

A gander belonging to the chairman of the soil conservation district chased me from the chairman's house to the car. Then he fell in love with my station wagon and wouldn't stop nuzzling it so I could leave.

The secretary at one of the schools I'm working with refers to me as the "Dirt Lady." She has a hard time remembering I'm from SCS.

Being a DC has its obviously challenging, serious side. But if you keep your sense of humor, it's a job that will reward you with some funny experiences, when and where you least expect them.

Ms. Anderson became district conservationist in Meridian, Idaho, in January 1977.

tive Order a decade ago, the program is designed to prohibit discrimination in federal employment based on sex. FWP gained greater clout with the passage of the Equal Employment Act of 1972, which brought Federal agencies under the equal employment opportunity provisions of the Civil Rights Act of 1964 for the first time.

The first SCS FWP coordinator was formally appointed in August 1973. There now is an FWP coordinator in each SCS State office and each TSC who spends varying amounts of time

on FWP activities. Coordinators work with administrators and women employees developing equal employment opportunity and upward mobility plans, counseling employees, and promoting self-development and continuing education.

Renee A. Sisson, FWP coordinator for SCS, says that what women want is simply equality of job opportunity. To supervisors of women in the Service, she advises: "Expect of women what you would expect of men in productivity, responsibility, and participation. To

expect less is patronizing; to expect more is unfair."

Drip Irrigation Aids Great Plains Windbreaks

by Jerry Schvien

Drip irrigation is making automatic tree-watering practical for the first time in the Great Plains. "It's a break from hose and pail," says Gene Anderson, Soil Conservation Service woodland conservationist in Denver, Colo.

Drip systems were cost shared on windbreaks for the first time this spring. Cost share is 80 percent and is available to farmers under both the Great Plains Conservation Program (GPCP) and the Agricultural Conservation Program (ACP).

"The survival rate has always been low on windbreaks in the semiarid Plains," said Anderson. "Our objective with drip irrigation is to provide additional water to help establish trees in their early years."

Keith Bruce, a farmer in Fort Morgan, Colo., installed one of the first drip systems. His windbreak of 300 trees is watered by a plastic pipe and 300 emitters, which drip the required amount of water directly at the base of each tree. His pipeline is completely above ground, snaking down the rows of trees from a nearby shed which houses the well, pump, and filtration system.

The efficient use of water is the most outstanding feature of drip irrigation. Drip systems also minimize losses to evaporation and seepage, save time, lower the mortality rate, and speed early growth.

Anderson says several different types of emitters can be used on windbreaks, from the very basic to the complicated. The emitters used on Bruce's 300 trees were 48 cents each. His total system cost \$420.

The program is popular with farmers. Some 67 drip systems were installed in Colorado this spring.

Cost sharing is available for drilling and casing small diameter wells, developing springs or seeps, water storage, small diameter pipelines, and inexpensive drip or similar type irrigation systems within the windbreak.

Mr. Schvien is public information officer, SCS, Denver, Colo.

Strawberry farmer Jack Tabata says the quality, color, and size of his berries are better with drip irrigation.



Irrigation Drop by Drop

Drip irrigation conserves precious water, improves crop quality, and brings nonarable land into production.

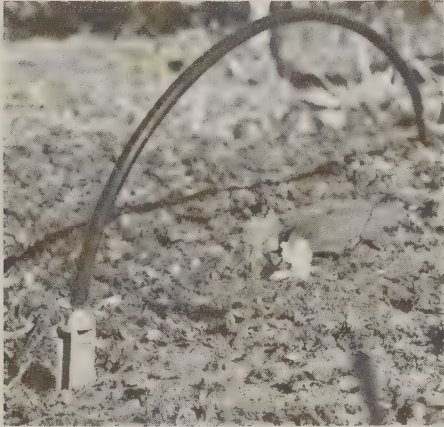
Although water dripping slowly—drop by drop—keeps most people awake in the middle of the night, it's helping a growing number of farmers around the world rest more easily.

Water dripping slowly, much as it falls from a leaky faucet, is the principle behind a new type of irrigation. Drip systems apply water frequently at the base of plants. Properly managed drip systems can use less water than other irrigation systems and eliminate erosion. Enthusiasts claim that they cut costs of fertilizer and labor while





Types of emitters include pressure compensating (right), spot spitter (below left), and spaghetti (below right).



boosting crop production and quality.

Drip systems consist of emitters, lateral lines, main lines, and a "head," or control station. Emitters control the flow of water from the lateral line to the soil at the base of a plant, generally at a rate of 1 to 4 gallons per hour. They come in more than a hundred styles. Some are simply perforations in lateral tubing; others, which look like pillboxes or small garden hose nozzles, are more complex and adjust water pressure. The number of emitters used ranges from less than one per plant for row crops to eight or more for large trees.

Generally, one lateral line is laid per tree row and one for each crop row or pair of rows. Main lines, usually buried, carry water from the head to the laterals.

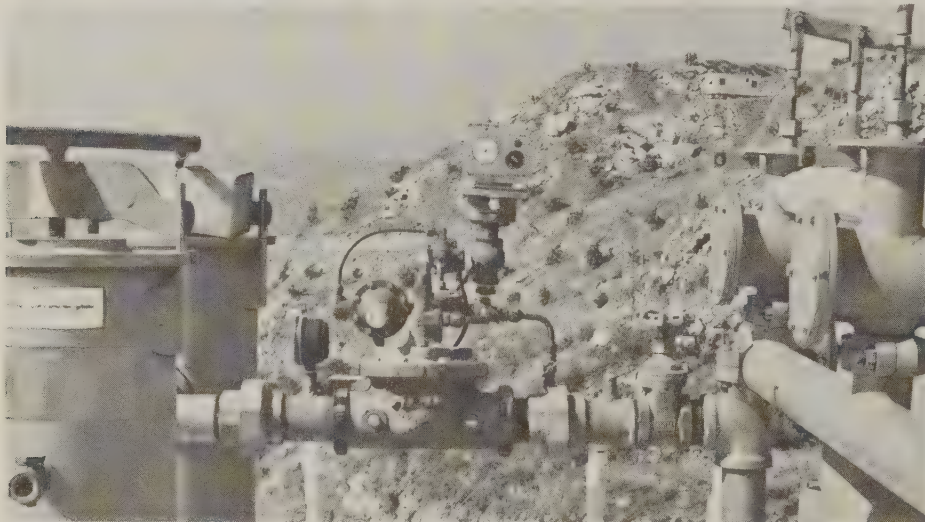
Emitters and lateral and main lines are usually plastic. Some emitters and lateral lines are used only one season; others are designed to last much longer. Main lines are usually permanent.

At the head, water is measured, filtered or screened, and treated with fertilizer. Chemicals are injected to prevent clogging of emitters. Water pressure is regulated as is timing of applications, generally 1 to 16 hours every 1 to 3 days.

Variations of drip, or trickle, irrigation include bubbler and spot spitter systems, but all incorporate the same principle of water applied slowly and frequently at the base of a plant.

Drip irrigation was developed largely in Israel and brought to southern California about 1970. By 1975, some 60,000 acres of California row and tree crops were drip irrigated, and by 1980, an estimated 100,000 acres will be under drip systems. Thousands more acres are drip irrigated commercially or experimentally in Arizona, Florida, Hawaii, Texas, and more than 35 other States.

At the end of 1975, more than 270,000 acres in 70 different crops were drip irrigated worldwide. By 1980, more than 850,000 acres of the world's crops are expected to be under drip systems, according to the University of California Cooperative Extension Service.



At the head or control station, water is measured, filtered, and treated with fertilizer. An automatic timer (center) run by a standard flashlight battery turns the water on and off to irrigate an avocado orchard near Fallbrook, Calif.



Gages in Chuck Kryder's orchards measure water pressure as a check for leaks in the system.

Conserves Water

Water conservation is one of the biggest advantages of drip irrigation, especially on young crops whose root systems are not fully developed. Drip systems apply water only within reach of plant roots instead of wasting water between plant rows.

"Drip systems saved 4,000 acre-feet of water on 4,500 acres of row crops in San Diego County last year," said Bernarr J. Hall, Cooperative Extension Service farm advisor for the county. With water costing \$80 to \$150 per acre-foot, the water savings translate into money savings of about a half-million dollars.

Hall estimates that in California drip systems use 50 percent less water than furrow systems on sandy soils and 20 to 30 percent less on finer textured soils.

An Agricultural Research Service (ARS) study conducted by Kenneth Davis and Sterling Davis at Riverside, Calif., confirms Hall's figures.

"We found that corn required 14 acre-inches of water under drip irrigation and 31 acre-inches under furrow," Kenneth Davis said. "Of course, the amount of water saved depends on how well the systems are managed. Drip systems are only 10 percent more efficient than well-managed sprinklers."

"The water you save through drip irrigation is what you would waste with another type of system," explained Chuck Kryder, a director of the Navelencia Resource Conservation District in Fresno County. Kryder drip irrigates fruit and nut orchards. "Drip systems save a lot of water on young trees. Although they save less on mature trees, they still use less water than other systems."

"Drip irrigation is the ultimate in water conservation," he added. "It should really help farmers during a drought."

Mike Mellano and Battista Castellano of San Luis Rey use drip irrigation on 70 acres of Shasta daisies, Gypsophila, asters, candytuft, asparagus fern, and eucalyptus for floral displays. The rolling terrain made their furrow system difficult to manage, so they switched to drip.

"We use about 30 to 40 percent less water with drip than with furrow irriga-

"Drip systems saved 4,000 acre-feet of water on 4,500 acres of row crops in San Diego County last year."

tion," said Mellano. "And since we use a constant feed system, when we use 30 percent less water, we're also using 30 percent less fertilizer."

Like many drip irrigators, Mellano uses tensiometers to measure soil moisture. But, he said, "A good farmer always passes his shadow over the plant. That's an old Italian saying I learned from my father. It means that there's no substitute for going out into the field and looking to make sure the crop is getting the right amount of water."

In addition to conserving water, drip systems help protect the quality of water supplies. Because drip systems are so efficient, there is little or no salty excess irrigation water to be pumped out of the ground and discharged back into rivers. The Soil Conservation Service, for example, is helping citrus farmers in the Wellton-Mohawk area of Arizona plan and install drip systems as part of the Colorado River Basin Salinity Control Program.

Saves Soil

In some parts of the country, arable land is fast becoming a limited resource. As industries and housing developments move away from inner cities to the outer edges of suburbs, they are taking over more and more prime farmland—causing the cost of the land and property taxes to skyrocket.

But in San Diego County, drip irrigation has enabled agriculture to "take to the hills." Growers are planting avocado orchards on rocky slopes of 60 to 70 percent, where furrow irrigation is out of the question and sprinkler systems are impractical.

"With a spitter system, we are developing 200 acres of avocados on rough terrain that before now had very

little value. Without drip irrigation, it could never be used for anything but grazing from February to May, and even then it would require 10 to 15 acres or more per cow," said Homer Williams, manager of orchards near Escondido.

"We develop these rugged hillsides with very little erosion by doing some of the things SCS has helped us with—laying out roads on the contour, terracing, using straw as mulch, and never disturbing the ground more than we absolutely have to."

Once the avocado trees are planted and the irrigation system is in place, the ground is not disturbed. Properly functioning drip systems produce no runoff to erode the soil.

Drip systems, in fact, are included in land treatment plans for the area above Dixon Dam, one of the flood control structures in Escondido's small watershed project. They help prevent sedimentation that would fill in the reservoir.

Produces Better Crops

Along with conserving soil and water, farmers credit drip systems with producing higher yields and better quality crops.

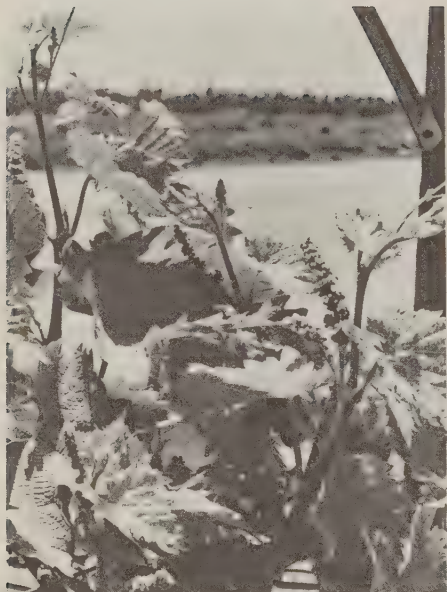
"We experienced a 20 percent increase in production in 1971 when we converted half our acreage from furrow to drip," said Jack Tabata, a strawberry farmer near Oceanside.

Tabata then converted entirely to drip irrigation, which allowed him to widen his strawberry beds to 60 inches, increasing the number of plants per acre. Last year he harvested 4,750 trays of strawberries per acre, almost twice the number he had produced with furrow irrigation.

Drip irrigation also expanded Tabata's growing season by providing a steady, optimum supply of water in-

By 1976, more than 270,000 acres in 70 different crops were drip irrigated worldwide. By 1980, more than 850,000 acres are expected to be under drip systems.

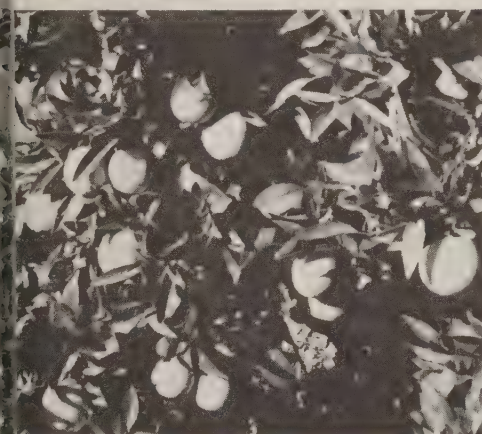
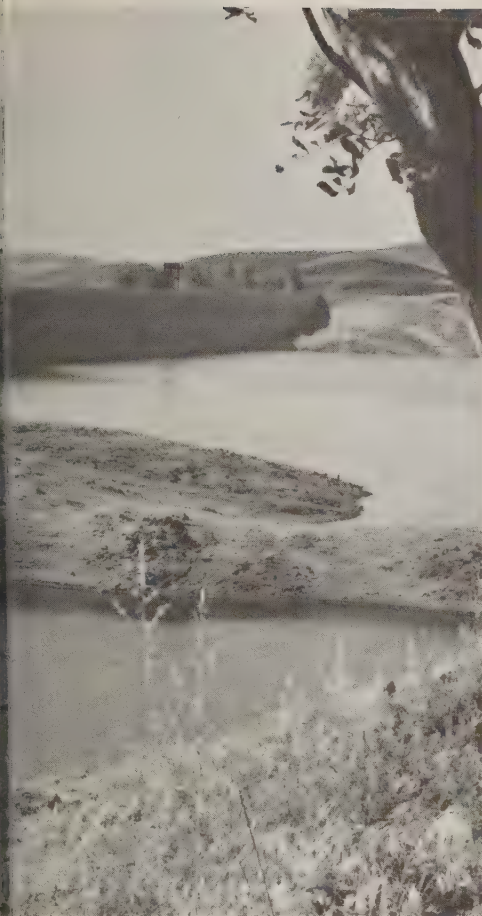
Last spring, Fresno County's Friant Dam and Millerton Lake held only one-fourth of the normal irrigation water supply. One of the biggest advantages of drip irrigation is water conservation.



Grapes for raisins (top) and kiwi fruit are grown under drip irrigation in California.



Layflat main tubing and buried lateral lines form part of the drip system irrigating tomato plants.



Citrus growers generally agree that the steady supply of water provided through drip systems produces better quality fruit by eliminating stress.

"Drip irrigation is the ultimate in water conservation. It should really help farmers during a drought."

stead of subjecting plants to wet and dry extremes as do furrow systems.

"We go to market 10 days earlier, and we pick strawberries 30 to 40 days longer than before," he said.

"The quality, color, and size of our berries are better with drip irrigation even though we have cut back fertilizer by 30 percent," Tabata added. He now sells more of his crop for the fresh berry market, which brings a higher price than berries sold for processing into jam and other products.

Citrus growers generally agree that the steady supply of water provided through drip systems produces better quality fruit by eliminating stress. Some growers also report that their trees are bearing heavy crops every year instead of every other year, which is normal for citrus.

In the ARS study, however, the drip system did not increase yields. "In our study on corn grown under drip and furrow irrigation, the yields are the same; drip irrigation is just a more efficient use of water," Kenneth Davis explained.

"If you do a good job of managing the irrigation systems, there is no difference in yields unless, of course, you increase the plant population," he continued. "The plant doesn't care how it gets water."

Cuts Labor

Jack Tabata said that his drip system also saves on labor costs since the water merely needs to be regulated, not tended.

"I'm budgeting the same amount of money for labor as I did 3 years ago even though wages have increased by 30 percent.

"Drip provides advantages in management," he said. "For example, on a cloudy day when it might rain, you irrigate furrows. If it does rain, you have to run out with shovels to open the furrow ends so the plants don't flood. With a drip system, you can turn it on just enough to sustain the plants but not flood them if it does rain."

A drip system designed by Allan Chaikin for an avocado orchard near

Fallbrook requires even less labor.

The system includes sand filters, screen filters, and fertilizer tank; buried main and lateral lines; emitters; and risers to elevate emitters. An automatic timer run by a standard flashlight battery controls the daily irrigation, and the system automatically switches to a 6-minute backflush cycle when the screen filters get dirty.

"One man comes in 1 day a week," said Chaikin. "He dumps two sacks of fertilizer in the tank and walks around to check for leaks. He checks gages at each 20-foot terrace level to make sure the water pressure and distribution are even. It takes about an hour."

Drip systems also provide other benefits. Because much of the soil surface between rows is never wetted, fewer weeds grow. The relatively dry and firm footing also makes field operations, such as harvesting, easier.

High Cost

Availability of drip systems is limited in some areas, and the drought has increased the already high demand for systems from an industry that started in this country only a few years ago. Because of this limited availability and the high cost of the systems, not all farmers who want to convert to drip systems will be able to right away.

"Because of the cost," said Bernarr Hall, "a grower has to get better yields or better quality, save on water and fertilizer costs, or cut labor to make drip irrigation economical."

Chuck Kryder's drip system cost \$300 per acre to design and install. He drip irrigates 3,000 young peach, plum, and almond trees on 30 acres. His system includes a 10 horsepower turbine to pump well water to the surface, a 5 horsepower booster to pump the water through a screen mesh filter, a main line, lateral lines, and one emitter per tree. As the trees grow, Kryder will add three more emitters per tree at a cost of 50 cents per emitter. Other systems cost from \$200 to \$1,000 per acre.

Because of the economics, drip irrigation is spreading fastest on high-

value crops, such as avocados—which gross more than \$1,200 a season per producing acre—and on other crops that require a high capital investment and much labor. Installing a drip system on such crops is a lower percentage of the total investment than on other crops, according to Jan van Schilfgaarde, director of the ARS Salinity Laboratory at Riverside.

Of course, not every farmer wants to convert to drip irrigation. For example, a farmer with a well-managed furrow or border irrigation system on level land may find the water savings do not offset the extra cost for energy and maintenance.

Although new systems are designed to drip irrigate additional types of crops every year, some crops are not readily adaptable. For instance, drip systems are not likely to replace giant center-pivot systems on the wheat and corn fields of the Great Plains.

In addition, some soils do not absorb moisture fast enough, so water runs off or ponds. Generally, drip systems work best on sandy soils and least efficiently on fine-textured soils.



In San Diego County, drip irrigation has enabled growers to plant avocado orchards on rocky slopes that previously had little value.

“Under furrow irrigation, capillary action pushed salt to the top of the beds . . . Our drip system has produced no salt buildup, and we are growing more, better quality flowers.”

Management Problems

Many farmers who do convert to drip systems find that because the openings are so small, emitters become clogged easily. “Clogging is the biggest problem with drip systems,” said van Schilfgaarde. “It changes the discharge rate and moisture distribution.

“There are three causes of clogging: mechanical, chemical, and biological. The type of clogging varies drastically from water source to water source,” he explained. “For example, in the Wellton-Mohawk area of Arizona, algae plug emitters. In San Diego County, however, the water is chlorinated so there are no algae.”

“Good filters are the first thing you need in a drip system,” Bernarr Hall said. “A sand filter screens out 99 percent of the particles that would cause mechanical clogging, and then a screen mesh filter catches all the others except those smaller than the emitter openings.” The filters themselves also must be kept clean.

Chemicals combining in the irrigation water also can cause clogging. Phosphate fertilizer, for instance, can react with calcium in the water and form granules that will clog fine mesh filters and openings.

“Remember to inject fertilizer between the sand and the screen mesh filters,” Hall advised. Minute amounts of dilute sulfuric acid added to irrigation water also help prevent chemical plugging by controlling the pH.

Some farmers are concerned about accumulations of salt around the perimeter of the area wetted by emitters. Van Schilfgaarde, however, explained that since the salt is crystallized, it should cause no problem. Only when the salt is in solution will it damage plants. The soil should not be allowed to dry between irrigations, as this could cause the movement of soil water to reverse and draw salt from the perimeter back toward the emitter. Also, during rains, irrigation should continue long enough to make sure the salts are leached below the root zone.

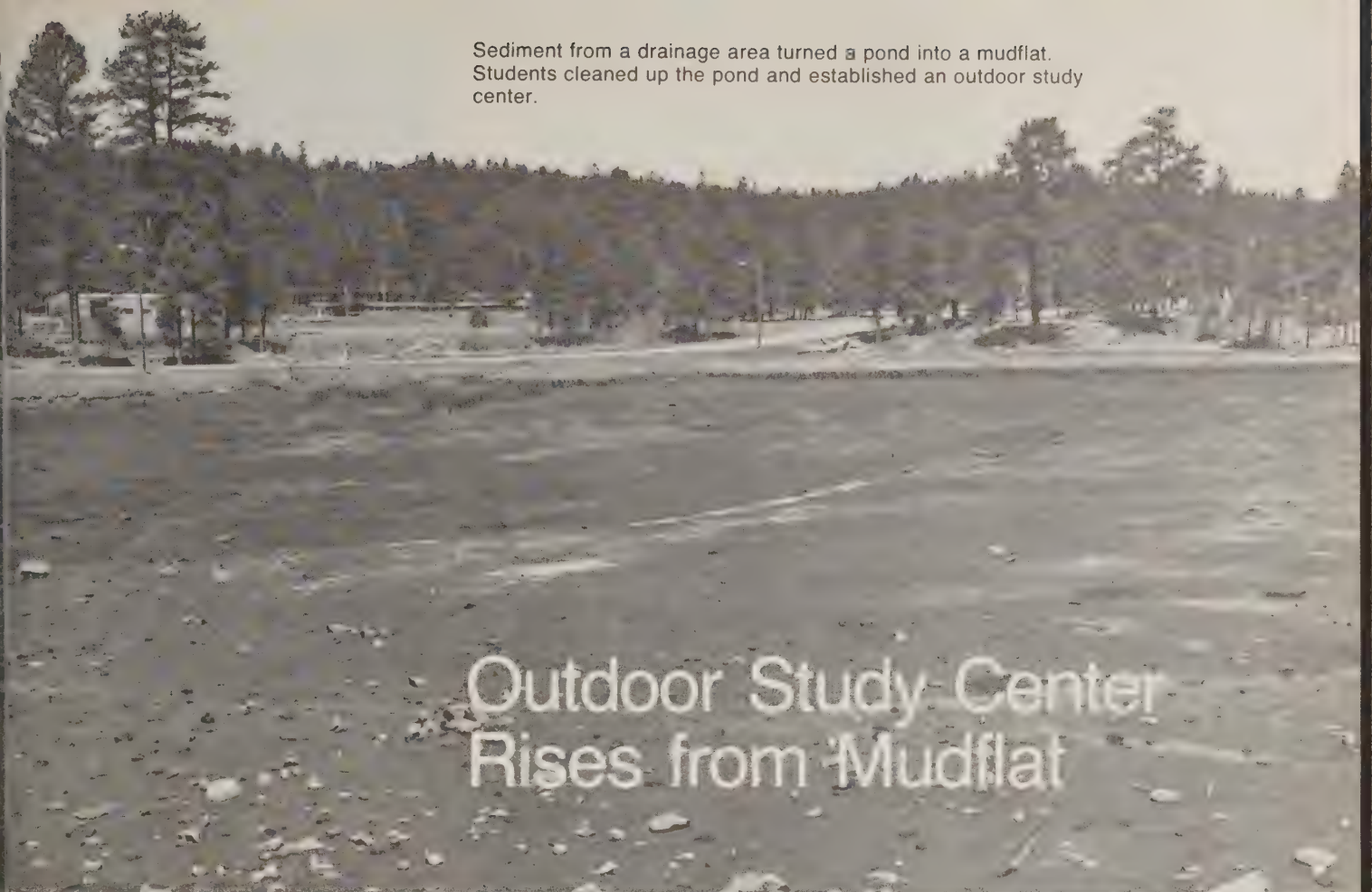
Mike Mellano said his drip system causes fewer salt problems than furrow irrigation. “Under furrow irrigation, capillary action pushed salt to the top of the beds. Concentrations built up, and the flowers did not stay at their peak as long. Our drip system has produced no salt buildup, and we are growing more, better quality flowers,” he said.

In some areas, rodents and coyotes damage drip systems by chewing lateral lines. The use of polyvinyl chloride (PVC) and buried laterals has largely eliminated this problem, but not before at least one irrigator came up with his own ingenious solution.

Allan Chaikin was puzzling over the problem of coyote cubs teething on laterals in an avocado orchard when he noticed a mail-order ad for wild animal scents in the back of a magazine. Remembering that mountain lions are natural enemies of coyotes, he ordered several vials of cougar urine. Chaikin dipped cotton swabs into the urine and stapled them onto redwood stakes placed throughout the orchard. “Within days,” he said, “the coyotes disappeared and never returned.”

Although drip irrigation is not for every crop, soil, and farmer, it meets many farmers’ special needs and offers great promise to agriculture where growing population and industry are increasing demands on a limited supply of vital resources—arable land and water.

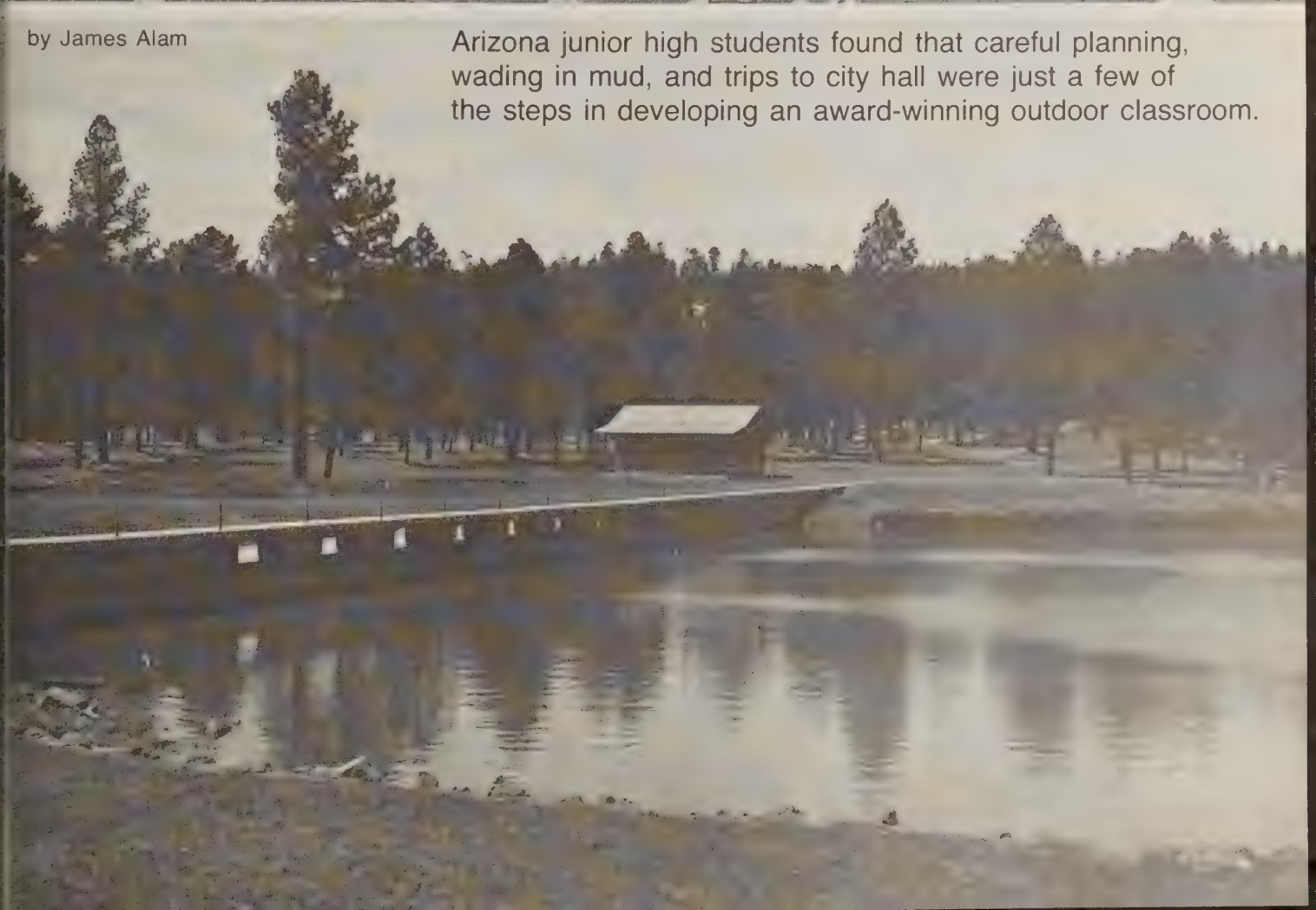
Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.



Sediment from a drainage area turned a pond into a mudflat. Students cleaned up the pond and established an outdoor study center.

Outdoor Study Center Rises from Mudflat

by James Alam



Arizona junior high students found that careful planning, wading in mud, and trips to city hall were just a few of the steps in developing an award-winning outdoor classroom.

Students, teachers, and the Youth Conservation Corps seed and plant the shoreline of the pond with selected grasses and legumes.



During the early planning stages, an inventory was made of wildlife and other natural resources.

More than 50 years ago, the city of Flagstaff, Ariz., set aside 100 acres of land known as Thorpe Park. Today, that land is the site of a prize-winning outdoor classroom developed by students and faculty of Flagstaff Junior High School with help from parents and local resource agencies.

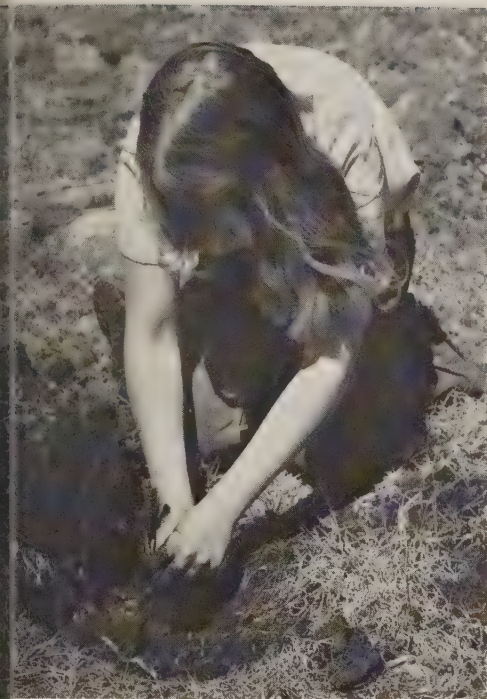
The 18.5 acres that make up the campus include a 3-acre pond built in 1923 below a small, city-funded dam on the Rio de Flag. The pond became the focus of a learning experience that took students beyond aquatic studies to meetings with city officials to discuss downstream flooding and traffic control on the school site.

The pond had provided seasonal swimming and ice skating for years, but sediment from the 55 square miles of drainage above the pond had turned the pond into an unsightly mudflat by the time the school was built in 1970.

"We had to drain the pond each year following the spring runoff, and recreational use of the area had become limited to a single campout each summer," noted Jim David, biology teacher and initiator of the outdoor study center. "The area had become a dump,



At the beginning of their cleanup campaign, students had to remove refuse from the pond, including tires and other auto parts.



Students planted pine seedlings following a plan developed with SCS help.



Tires are used to build an artificial reef for aquatic insects and fish.

and plants and wildlife suffered because of extreme fluctuations in water levels."

David began a cleanup campaign on campus and encouraged some of his students to assist in a successful effort to clean up the pond area. The "I care" buttons still worn by students recall those days.

However, the battle at the pond was not so easily won. The remains of each summer's campout greeted the students upon their return every fall. One of David's former students noted that: "If it had not been for Mr. David's encouragement and enthusiasm, we would have been willing to ignore that mess and live with it. However, during the cleanup stages and when we ran into problems on the project later, Mr. David never gave up and challenged us to do the same."

The turning point for the project came during the 1974-75 school year. The cleanup work had gained the support of other teachers and administrators and a number of parents. Dick McCallum, a counselor at the school, mentioned David's work to Soil Conservation Service people during a dis-

cussion about some student conservation projects. The teachers and students, with help from SCS, began to collect ideas and to plan the use of the area.

As it turned out, developing a plan and seeking permission from city officials to create their "dream," transformed what had been a learning process about natural resources into a political science class. During the late spring of 1975, David and his students spent a lot of time at council and commission meetings trying to convince people of the value of their project.

Downstream flooding, traffic on Aztec Street, and access for emergency vehicles to nearby ball fields and to an adjacent subdivision were related issues that had to be resolved. Before school closed for the summer, however, the project won official approval and construction began during vacation. With help from the city, students started by removing refuse, including tires and other auto parts, that had accumulated in the mud.

USDA's Forest Service, under the Educational Act of 1970, provided

heavy equipment to construct the wishbone-shaped island in the middle of the pond. This unusual shape, which will provide maximum "edge" habitat for wildlife, was submitted by Luke Ferguson as part of a class project to design the island. Following the completion of the island, students, teachers, and the Youth Conservation Corps seeded the island and shoreline with selected grasses and legumes according to plans developed by SCS. Three small, rock dams were built in the Rio de Flag drainage above the pond to help trap sediment and protect the pond area.

By the beginning of the 1975 school year, the pond was ready and students looked forward to expanding their efforts to the surrounding area. A boost to enthusiasm was provided when the Arizona Bicentennial Commission recognized the outdoor classroom as a Youth Bicentennial Project for the Flagstaff area. In addition to a \$1,400 grant to support the work, the commission cited the program, noting that "education in wildlife management and outdoor learning centers are needed in every community. Outdoor learning



The pond is only a short walk from the school building; but when students are studying in the outdoor classroom, they no longer feel they are on the school grounds.

centers are a continuing program and will serve future students."

Equipment, seed, and construction materials were purchased using matching funds from the school district. During the year, aquatic animal life such as filament algae, one-celled organisms, rotifers, fairy shrimp, crayfish, frogs, bluegill, and largemouthed bass were stocked in the pond. A plant center was designated for experiments with different species for landscaping, erosion control, and wildlife habitat.

Although the entire campus, including the building and parking lots, is included in the conservation plan for the outdoor study center, the water and surrounding "natural" area take on special meaning.

"The pond is an extension of the school campus, but it is not on the schoolground and that's one reason it's important," said Cheryl Covington, a junior high teacher. "Although we can reach the natural area with a few minutes' walk from the school door, once we're at the pond our students no longer feel they are on the school grounds. There is something special

about the area and the students treat it with consideration."

An "Outdoor Classroom Project Guidebook," developed by teachers and students, identifies plans for use of the area over the next decade.

Both teachers and students view the project with varied ideas of its benefits and potential. "Few teachers got involved in the early stages," according to teacher Carol Painter. "More and more became interested and involved as things began moving, and many are using the area now." The feeling has spread to nearby schools and to Northern Arizona University (NAU), which used the outdoor lab for several classes this past year.

David is working with NAU instructors to develop teaching guides for the outdoor classroom and to design a university-level summer course that would explore environmental education teaching methods.

Kam Marsh, one of several students who bus to school from Oak Creek, about 25 miles south of Flagstaff, says student enthusiasm for afterschool work on the pond convinced the school board to authorize an activity bus on

pond workdays: "If you want something worthwhile and can present the facts properly, you often get what you're after."

"I never would have gotten up in front of a group of adults to speak if it hadn't been for the project," added David Nations, now a senior at Flagstaff High School and president of the student council. "Working on the outdoor study area did more to build school unity and support than anyone would have expected."

Luke Ferguson, who designed the wildlife island for the pond, today is a high school junior. It's his feeling that "we created something we know will be there in the future, something we can visit often and see the results of our efforts."

Mr. Alam is district conservationist, SCS, Flagstaff, Ariz.

Flood Water "Gets Right on Out" of Stumpy Bottom

In the West Virginia community that used to be plagued by flooding, stream improvements prevent flood damage and reduce health hazards.



Before residents were assisted by the Mountain-Dominion RC&D Area, they had perennial flooding problems with damage averaging more than \$6,000 a year.

They call it "Stumpy Bottom," but up until 2 years ago, it was more soggy than stumpy. That was before a Resource Conservation and Development (RC&D) measure showed local residents how to handle stormwater.

This 47-acre community near Princeton, W. Va., was built on a low area filled with stumps. Most of the stumps were removed, but flooding remained a perennial problem. Runoff from a 170-acre watershed flooded the area regularly—often several times a year. The average price tag on flood damage was more than \$6,000 a year.

"We had many floods," said resident R. L. Thomas, "and water would stand for days after a heavy rain."

Health hazards rose along with the floodwaters. Mosquitoes and rats were potential disease carriers. Sewage disposal was inadequate. The Mercer County Health Department finally banned further installation of septic tanks in the area.

Some of the more than 50 homeowners tried to minimize flood damage by installing small drains and culverts here and there. Their efforts had little effect.

So residents took their community's problems to the steering committee of the Mountain-Dominion RC&D Area. The committee, composed of local people concerned with the proper development and management of natural resources, asked the Soil Conservation Service to explore possible solutions.

That was the beginning of an effort that ultimately involved several agencies, and many local people.

SCS recommended improving one stream to carry away the storm runoff and installing a ditch to remove stand-

ing surface water. The West Virginia Department of Highways agreed to install culverts under a road to provide an adequate outlet for the water to flow into an existing stream. The Mercer County Commission acquired land rights and joined with the Southern Soil Conservation District in sponsoring the measure.

The improvements were completed in the spring of 1975 at a cost of \$10,972 in RC&D funds. The county commission maintains the improvements.

Homeowners and businessmen now enjoy the measure's benefits. "When it rains now," Thomas said, "the water gets right on out of the bottom. It's a grand thing!" An industry that recently located in the area also found the measure to be a big help in site preparation. Stoner Parsons, the company's owner, believes that it "will help for years to come."

C. B. Yearout, a cochairman of the Mountain-Dominion RC&D steering committee, feels that the measure's results have demonstrated for people in the community that "much can be accomplished when government agencies and local citizens work together toward a common goal."

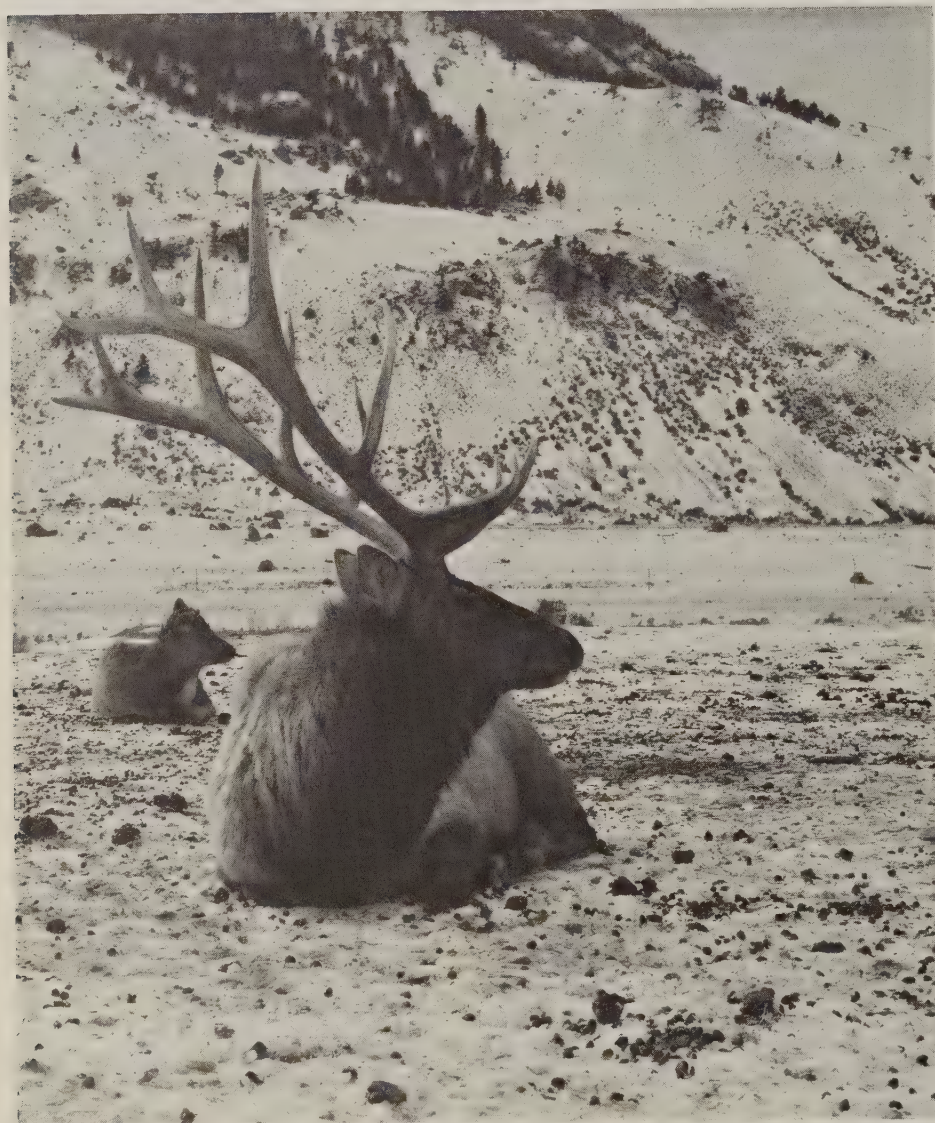
Mr. Gilkeson is RC&D coordinator, Mountain-Dominion RC&D Area, SCS, Princeton, W. Va.

Good range management on Federal resource lands in Wyoming helps nearly 20,000 Teton elk survive the harsh winters.

by R. Steve Scheldt



Elk Country



Without supplemental feeding, range management, and conservation practices, elk herds in Wyoming would be decimated or even extinct.

Jackson Hole in western Wyoming has been elk country as long as anyone can remember. In the vast wilderness, the call of the bull elk is as much a part of fall as the shimmering gold aspen, skiffs of ice on streambanks, and a fresh mantle of snow on the majestic Tetons.

But without the intervention of government agencies and other conservation groups, the Teton elk herd would be decimated or maybe even extinct.

In the early 1900's the Federal Government began its effort to preserve the elk's natural habitat around Jackson Hole. Since about 1957, the Soil Conservation Service has been working with local and other Federal agencies to conserve and manage the land mainly for elk.

The elk herd at Jackson Hole is one of the two largest herds of native elk in North America. Its habitat includes most of Teton County, all of the Teton National Forest, and part of the Bridger and Targhee National Forests. The heart of the summer range covers Grand Teton National Park and much of the southern part of Yellowstone National Park.

Historically, the elk migrated to winter ranges in valleys along drainageways of the Snake River, including Flat Creek, Buffalo Fork, Spread Creek, and the Gros Ventre River. Even after a severe storm in November 1896, residents of Jackson estimated 20,000 elk at Flat Creek. But during the severe winters of 1909 and 1911, thousands of elk starved.

In an effort to provide food for the elk in winter, Congress appropriated \$50,000 to buy land to raise hay for



—courtesy, U.S. Fish and Wildlife Service

the animals. In 1913, 1,760 acres were bought with the money, and in that same year, 1,040 acres of public land were added by Presidential Order. This land was used for the National Elk Refuge which was established for the preservation of the elk wintering in Jackson Hole. The Izaak Walton League of America donated an additional 1,760 acres to the refuge in 1927, and through the 1950's more land was purchased as it became available.

Today, the refuge covers 24,000 acres and is managed entirely as wildlife habitat. Although it was established mainly for elk, the refuge also benefits other wildlife. Mule deer, bighorn sheep, and coyotes live on the refuge, and a small resident flock of rare trumpeter swans winters there.

With the establishment of the National Elk Refuge, the U.S. Biological Survey and its successor, the U.S. Fish and Wildlife Service, began feeding operations. Each winter since 1912, except during 7 years of light snowfall and mild weather, elk have been fed on the refuge.

The present elk population wintering in areas drained by the upper Snake River and its tributaries numbers about 20,000 even though some of the former winter range has been taken for agriculture and other development. Of these, about 8,000 elk winter on the National Elk Refuge, and about 8,000 winter at nine smaller feedgrounds operated by the Wyoming Game and Fish Department. The rest range free on other Federal land.

The National Elk Refuge may sound like simply a feeding ground or elk wel-

fare program, but present objectives are to manage the elk winter range to provide only supplemental feed. No hay has been harvested since 1966, and all forage is left standing for elk to use on a free-ranging basis.

The Fish and Wildlife Service entered into an agreement with the Teton County Conservation District in September 1957. Through the district and Soil Conservation Service, many conservation practices have been planned and implemented to enhance the wildlife habitat. Soil surveys and wildlife land resource inventories have been completed, and thousands of feet of irrigation ditches have been installed. More than 2,000 acres in the refuge are irrigated.

Clipping data show that under irrigation Russian wildrye produces approximately 1,400 pounds per acre, and smooth brome and alfalfa produce 2,000 pounds. Elk showed a preference for wildrye on the refuge, using 75 percent of the annual production, compared to 40 percent of the smooth brome and alfalfa. Besides being more palatable, wildrye remains upright after curing and under normal snow cover.

One problem for refuge managers has been holding elk on the north end of the refuge where sagebrush and grass intermingled with stands of aspen produce a large amount of native forage. In the past, once the elk were on the refuge, they migrated to the subirrigated meadows and irrigated pastures at the south end.

Because fencing is not a reasonable alternative, other methods are being used to establish a pattern of use at

the north end. To improve forage quality and quantity, sagebrush has been controlled on some of the area by tilling, raking, chopping, trampling, and prescribed burning. And some areas have been reseeded with wildrye to make the area more attractive to elk.

Prescribed burning appears to help control sagebrush and in some areas has increased grass production by as much as six times. In some decadent aspen stands, fire appears to stimulate suckering, resulting in successful regeneration.

Small stacks of hay, strategically placed, also have helped hold elk at the north end. Forage utilization is highly dependent on animal distribution. Feeding elk alfalfa pellets in a line leading toward the area to be grazed has proved to be successful in moving elk from one area to another. Once the animals are there, pellets can be used to hold them in the area. Elk can be moved several miles a day by this method.

Federal and State agencies must cooperate to insure the existence of the elk. The Fish and Wildlife Service, National Park Service, Forest Service, Wyoming Game and Fish Department, Wyoming Outfitters Association, Soil Conservation Service, and many other groups and individuals have a part in making the complex management decisions that control the future of possibly the largest elk herd in the world.

Mr. Scheldt is a wildlife biologist, SCS, Grand Junction, Colo.

A Profile of Our Soil and Water Resources

by Nadine E. Pitts

A variety of questions about land and water quality will be answered by a national study of soil erosion.



Data are being collected to determine the condition of our Nation's soil and water resources. During the first stage of the study, the most common types of erosion will be evaluated.

A decade ago the most comprehensive conservation needs inventory ever undertaken showed that erosion was the dominant conservation problem on about half of the Nation's privately owned rural land.

How much of a problem is soil erosion today? How much land continues to be damaged by wind and water, and how much topsoil ends up as sediment polluting our rivers, lakes, and streams?

The Soil Conservation Service has embarked on a two-stage national erosion inventory to answer these questions and to update the 1967 National Inventory of Soil and Water Conservation Needs. The survey will evaluate soil and water conservation needs, prime farmland, potential cropland, water quality, wetlands, and land use.

When the inventory is completed in 1979, the Nation will have an up-to-date profile of its soil and water resources and their condition.

Iowa State University (ISU) Statistical Laboratory helped design the study. It also will help analyze the complex data, using computer techniques.

The inventory is more comprehensive than the one made in 1967, which included only nonfederal, rural lands. The new study includes all nonfederal lands, Federal lands leased to private operators, and National Forest System lands. All Federal land management agencies have been invited to participate in the study.

Data are being gathered by SCS personnel at 72,500 sites in 49 States

(all but Alaska), Puerto Rico, and the Virgin Islands. USDA's Forest Service is assisting SCS in field evaluations of sample sites on private forested lands, and will collect data on National Forest System lands.

Sample sites range in size from 40 to 640 acres, and were selected at ISU's Statistical Laboratory by random sample methods. Half the sites used in the 1967 inventory are represented in the new study, which will allow comparisons between conditions then and now in those areas.

The most common types of erosion—sheet, rill, and wind—are being studied during the first stage of the study. Gully, streambank, roadside, and construction site erosion will be inventoried during the second stage.

By mid-1979, SCS will be able to calculate estimated sediment yields from all types of erosion. The inventory also will supply information useful in other current research. USDA's Economic Research Service plans to use inventory data in its study of social and economic factors relating to soil erosion.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.

News Briefs

Flood Prevention on the Washita

Flood protection efforts on tributaries of Oklahoma's Washita River prevented \$20 million damage during two storms last spring, according to a Soil Conservation Service study.

Although the storms caused several million dollars of flood damage, additional losses were averted by about 1,000 structures that have a combined floodwater capacity estimated at 195 billion gallons. The land treatment practices above the structures also helped control the flooding.

Significant flooding occurred in four subwatersheds of the Washita River, while the retarding structures safely contained potential floodwaters in 60 subwatersheds. The May 1977 storms averaged nearly 4½ inches of rainfall throughout the Washita Basin during a 2-day period, followed by about the same amount of rain over a large section of the watershed during 1 day less than a week later.

The 1,000 floodwater retarding structures cost about \$80 million.

Aerial Seeding in New Hampshire

In fall 1976, 17 farmers participated in an aerial seeding program in Grafton County, N.H., where some farms are losing 15 to 18 tons of soil per acre each year. Winter rye was planted from the air before the corn was harvested. Within 2 weeks, the cover crop had grown 2 to 3 inches. The Agricultural Stabilization and Conservation Service shared 50 percent of the cost with the farmers. The seeding resulted in an estimated 3 tons per acre of organic matter which was plowed back into the soil last spring.

Meetings:

October

2-6	Congress for Recreation and Parks, Las Vegas, Nev.
2-6	National Association of County Agricultural Agents, Hartford, Conn.
2-7	Water Pollution Control Federation Conference, Philadelphia, Pa.
8-12	American Institute of Planners Conference, Kansas City, Mo.
14-20	National Environmental Sanitation and Maintenance Educational Conference, Exposition, Lake Buena Vista, Fla.
15-19	American Bankers Association, Houston, Tex.
16-19	American Forestry Association, Monterey, Calif.
20-23	National Association of Biology Teachers, Inc., Anaheim, Calif.
25-29	American Horticultural Society Conference, Pasadena, Calif.
27-28	American Association for Vocational Instructional Material, Fargo, N. Dak.
29-Nov. 2	Adult Continuing Education National Conference, Detroit, Mich.
31-Nov. 2	American Association of State Highway and Transportation Officials, Atlantic City, N.J.

November

6-9	Irrigation Association, New Orleans, La.
7-9	Geological Society of America, Seattle, Wash.
8-11	Future Farmers of America, Kansas City, Mo.
13-16	National Forest Products Association, San Diego, Calif.
13-17	American Institute of Chemical Engineers, New York, N.Y.
13-18	Soil Science Society of America, Los Angeles, Calif.
14-22	The National Grange, Greensboro, N.C.
15-16	Purdue Air Quality Conference and Exhibition, Indianapolis, Ind.
22-26	National Council for Geographic Education, St. Louis, Mo.
29-Dec. 1	Western Forestry and Conservation Association Conference, Seattle, Wash.
30-Dec. 2	Keep America Beautiful, Inc., National Meeting, New York, N.Y.

December

4-6	American Society of Farm Managers and Rural Appraisers, Inc., Denver, Colo.
5-9	American Geophysical Union, San Francisco, Calif.
12-13	American Society of Agricultural Engineers, Erosion and Sedimentation Symposium, Chicago, Ill.

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Soil Conservation

November 1977

U.S. Department of Agriculture

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Saving Energy, Soil, and Water

From the Administrator

The men and women who use America's land wisely save energy along with soil and water.

As an article in this issue points out, soil conservation practices and systems could save 1 of every 7 gallons of fuel used in U.S. agriculture.

That is one more reason why soil and water conservation makes good sense. SCS and local conservation district leaders need to pass the word to every corner of our Nation. Potential energy savings might encourage more people to say "yes" to good land use.

Less energy is needed if we keep soil in place on the land than if we have to dredge it out downstream, bulldoze it off streets, or filter it out of water supplies.

Less energy is needed if we keep fertilizers and agricultural chemicals in place on the land than if we have to remove them as pollutants somewhere else and then manufacture, transport, and spread more chemicals to keep the land productive.

Less energy is needed if we recycle animal wastes for plant nutrients right there on the farm or ranch than if we substitute manufactured fertilizers.

Less energy is needed if we add the right amount of water at the right time through a good irrigation system than if we waste half of what we pump.

Less energy is needed if we use minimum tillage than if we clean till the fields.

Less energy is needed if we keep prime farmland in production than if we replace it with land that needs clearing, draining, terracing, irrigating, or more added nutrients.

Other conservation practices may not reduce energy needs directly but do make it possible to grow more food and fiber without increasing energy use.

Not all conservation practices will succeed everywhere under all conditions. Many will call for more careful management by the land user. Most of them will call for an investment that won't be repaid immediately.

SCS and conservation district people can help each land user figure out the practical ways to save soil, water, and energy while making a living . . . and then help put conservation plans into practice.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

Minimum tillage saves fuel by reducing the number of tillage trips across the field. For six other ways to save energy through soil and water conservation, see the article beginning on page 4.

Soil Conservation

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Seven Ways Conservation Saves Energy



A slot-type planter is used to plant soybeans in wheat stubble. Energy savings can be achieved by using conservation tillage, which eliminates use of the moldboard plow and reduces the number of tillage trips.



The conservation plan—after years of showing the way to control erosion and water pollution—is finding its place in energy conservation efforts on farms and ranches.

Farmers and ranchers searching for ways to cut energy costs should take a close look at some of the most popular soil and water conservation management systems. Conservation practices that make up these systems not only conserve soil and water, they also conserve fuel—and in substantial amounts.

Energy costs have nearly doubled in the last 10 years. The price of fuel—gasoline, diesel, natural, and LP gas—will continue to rise and local or regional shortages are likely.

Seven conservation practices have the potential to save more than 1 billion gallons of fuel a year—or 1 of every 7 gallons needed for agricultural production in the year 2000.

The practices—minimum tillage, improved irrigation, pasture management, waste management, parallel terracing, windbreaks, and controlling soil saturation on cultivated land—would boost fuel efficiency by cutting fuel needs per acre or by increasing crop yields per acre, or both.

Minimum Tillage

Of the seven, minimum tillage offers the greatest potential for energy savings. This newer practice has grown in use from 3.8 million acres in 1963 to about 40 million today.

Although the practice varies considerably, it reduces the total number of tillage trips across the field. Roughly tilled land with large amounts of crop residue left on the surface is effective in controlling soil erosion and conserving moisture. Studies show a reduction of 50 percent or more in soil loss over conventionally tilled fields. "Conservation tillage" basically eliminates use of the moldboard plow and achieves even greater energy benefits. It involves use of a slot-type planter in an undisturbed seedbed and use of chemicals for weed and pest control.

In addition to the conservation advantages, farmers have significantly reduced both fuel and labor inputs by shifting from conventional to minimum tillage. A USDA Extension Service study shows that in 1974, per-acre fuel

Energy costs could be saved by more precise scheduling of water through sprinkler irrigation systems.



Water efficiency could be increased as much as 10 percent just by better management practices to apply irrigation water at the proper time and in the proper amount.



and labor costs for conventional tillage averaged \$6.11 compared with \$3.43 for minimum tillage. Fuel costs were reduced almost 54 percent.

Fuel savings and conservation benefits make two strong selling points in encouraging farmers to practice minimum tillage.

USDA's Office of Planning and Evaluation in its report, "Minimum Tillage: A Preliminary Technology Assessment," projected that as much as 81 percent of U.S. cropland could be minimum tilled by the year 2000. Fuel savings would amount to 760 million gallons a year, or 9 percent of the total energy now used in agriculture.

Improved Irrigation

The second greatest potential for energy savings lies in improving efficiency of irrigation water use—to reduce the amount of water pumped per acre.

Irrigation efficiency in the United States is about 50 percent. This does not mean that half the water pumped

A well-designed irrigation system that uses water more efficiently—thus causing less erosion and pollution damage—greatly reduces energy needs.

for irrigation is lost. It just is not used properly. Much of it is recycled back into the irrigation supply as waste or tailwater. Water applied at too high a rate and in too great a quantity can result in serious soil losses or water logging. Surplus tailwater carries sediment, herbicides, and nutrients that adversely affect water quality downstream.

A well-designed system that uses irrigation water more efficiently—and thus causes less erosion and pollution damage—also greatly reduces energy needs. Proper design of irrigation systems involves careful evaluation of soils, topography, amount of available water, types of crops to be irrigated, and the water delivery system.

The Soil Conservation Service Special Projects Division, for the 1975 Na-

tional Water Assessment, projected irrigation water uses for the years 1985 and 2000 under a normal level of development and under high efficiency levels.

Under high efficiency levels, water diversions by 1985 could be reduced by 55.8 million acre-feet a year, saving 231.2 million gallons of fuel yearly.

To achieve these savings would require an accelerated program of updating irrigation systems and improving water management through irrigation piping, ditch lining, and land leveling using the best practical technology available. It would require cash outlays for improving 28,000 miles of off-farm canals and laterals and 20 million acres of onfarm irrigation systems.

Thus, the savings of 231.2 million gallons of fuel a year would be offset

Improved pasture management in the United States could increase forage yields as much as 106 million animal-unit-months. This would lower the amount of fuel used per animal-unit-month substantially.



Liquid manure is applied to alfalfa. Full use of animal waste as fertilizer could mean a lot less energy needed to produce and distribute inorganic commercial fertilizers.



As commercial fertilizer prices rise and shortages persist, more and more farmers will be looking at the value of animal waste as fertilizer.

by the energy needed to make these improvements.

Water efficiency could be increased as much as 10 percent with little or no outlay for capital investment—just by better management practices to apply irrigation water at the proper time and in the proper amount. This would save 75 to 80 million gallons of fuel yearly.

A Nebraska study estimated that \$7.1 million in energy costs could be saved per year through more precise scheduling of water through sprinkler irrigation systems in the State.

Pasture Management

Improved pasture management in the United States could increase forage yields as much as 106 million animal-unit-months (an AUM is the amount of forage required to feed 1 mature beef

animal or its equivalent for 1 month). This would lower the amount of fuel used per AUM substantially, even though it takes more energy to manage a pasture well. The indirect savings would be about 58 million gallons of fuel per year.

An added benefit of good pasture management that leads to energy savings is the lowering of nitrogen needs by adding legumes to the grass mixture.

In addition to saving energy, good pasture management provides permanent vegetative cover which is an extremely effective method of controlling soil erosion.

Waste Management

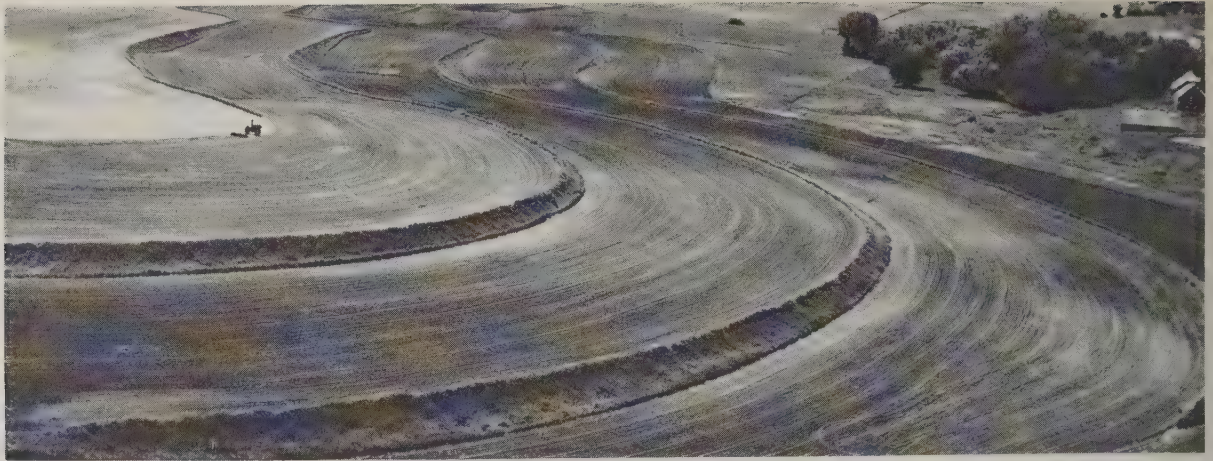
Full use of animal waste as fertilizer could mean a lot less energy needed

to produce and distribute inorganic commercial fertilizers. Proper handling of waste also would greatly reduce pollution in streams, rivers, and lakes.

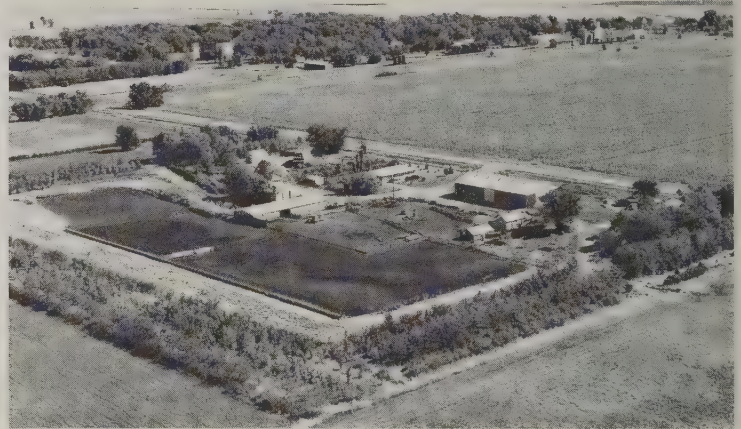
U.S. farmers and ranchers now use 8 million tons of commercially produced nitrogen, 4 million tons of phosphorus, and 4 million tons of potassium each year.

If just the waste from feedlots were used as fertilizer, the nutrient value would equal 22.5 percent of the commercial nitrogen used yearly, 17.6 percent of the phosphorus, and 30.7 percent of the potassium. It is difficult to estimate the net energy savings from waste management because there is not enough data available on the quantities of waste used.

In 1974, the Texas Governor's Energy Advisory Council did an animal waste study in feedlots of the High Plains. All the waste produced was being used for fertilizer. This amounted to a net energy savings of the equivalent of 20.5 million gallons of gasoline that year.



In low rainfall areas parallel terraces and contour farming save energy by preventing water losses from high intensity storms, making more of the rainfall available for crop use.



In addition to reducing fuel needs, windbreaks protect livestock. Feedlot operators in South Dakota report that cattle protected by a tree belt gained 2½ pounds a day during winter compared with the usual 1 to 1½ pounds for cattle kept in other feedlots.

As commercial fertilizer prices rise and shortages persist, more and more farmers will be looking at the value of animal waste as fertilizer.

Parallel Terraces

Parallel terraces, like contouring and standard terraces, are extremely effective in controlling erosion. They are essential on many acres if cultivated crops are to be raised.

In most areas, contour farming and standard terraces are energy users because resulting increases in farming time are not completely offset by increases in crop yields. Parallel terraces and contour farming do save energy in low-rainfall areas like the Great Plains by preventing water losses from high intensity storms, making more of the rainfall available for crop use.

Windbreaks

Farmstead and feedlot windbreaks protect buildings from cold winter winds and reduce fuel needs.

Farmstead and feedlot windbreaks protect buildings from cold winter winds and reduce fuel needs . . . cutting heating costs as much as 30 percent.

Farmstead windbreaks have cut heating costs as much as 30 percent.

Feedlot operators in South Dakota report that cattle protected by a tree belt gained 2½ pounds a day during winter compared with the usual 1 to 1½ pounds for cattle kept in other feedlots.

Unfortunately, farmstead and feedlot windbreaks are not established overnight. It may be years before full benefits are achieved, but this is not deterring many farmers and ranchers. In 1976, farmers in North Dakota planted 2,600 acres of farmstead and feedlot windbreaks, according to an article in the July-August 1977 issue of *The Furrow*.

Fred Atcheson, Kansas State extension forester, said he prepared more than 100 plans for new windbreaks in

the first 6 months of 1977, nearly all of them to protect farmsteads or cattle. "I've never seen more interest in these kinds of plantings."

Controlling Soil Saturation

Poorly drained cultivated land consumes more fuel per unit produced than the same soil with adequate drainage; soggy land delays planting, and delay means lower yields.

In the central Corn Belt, research showed that for each day planting is delayed from May 1 through May 15, yields drop 1 bushel an acre. Each day's delay during the rest of May reduces yields 2 bushels an acre, yet the amount of fuel used remains the same.

Saturated soil also increased the threat of erosion and flooding since rainfall is forced to run off. Appropriate

Plastic tubing is installed on cultivated land to control soil saturation.



The seven conservation practices boost fuel efficiency by cutting fuel needs or increasing crop yields, or both.



The practices offer a way for agriculture to join the country's energy conservation thrust while protecting our Nation's soil and water resources.

subsurface water-removal systems provide a 2-foot "sponge" at the top of the soil profile through which rainfall can be absorbed and safely discharged. Subsurface water-removal systems also help control salinity in arid regions by helping salts leach out more easily.

The last National Inventory of Soil and Water Conservation Needs showed that more than 40 million acres of tilled cropland had soil saturation problems. This involved only Class I and II wetlands. Improving soil moisture conditions on these acres would save more than 160 million gallons of fuel and would increase yields as much as if more than 14 million more acres were farmed.

Potential fuel savings from improved soil moisture conditions on cultivated

lands vary considerably among States. More than 54 percent of the total could be saved in just four States: Indiana (17.9), Minnesota (16.7), Ohio (10.8), and Illinois (8.8).

To determine net energy savings, fuel requirements for installing and maintaining the water-removal systems would need to be computed and distributed across the expected life of the measures. However, improving drainage of cultivated lands could be an economical and environmentally sound way to increase U.S. output of food and fiber without clearing pasture and woodlands and without draining areas that are not being cropped.

Potential for Energy Savings

Since the Nation's 2½ million farms and ranches consume only 3 percent

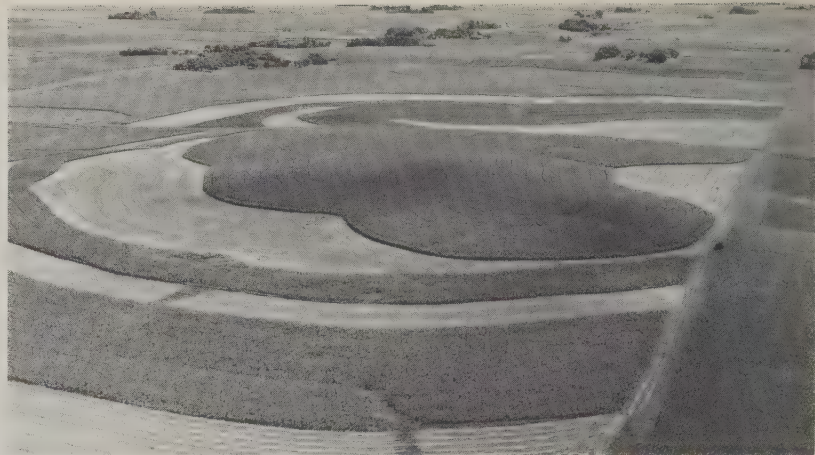
of energy used in the country, soil and water conservation practices certainly are not the only answer to U.S. energy problems.

The practices do, however, offer a way for those who work in agriculture to join the country's energy conservation thrust while also protecting our Nation's natural soil and water resources.

They also offer farmers and ranchers some relief from the soaring costs of fossil fuels.

Mr. Gray is director, economics division, SCS, Washington, D.C.

Mr. Black is chief, conservation planning branch, conservation operations division, SCS, Washington, D.C.



During the Midwest convention of the National Association of Farm Broadcasters, Bruce Lease (left), farm director at a Minnesota radio station, conducts a live interview with Leroy Swenson, president of the Minnesota State Association of Conservation Districts. The convention included a conservation tour to give the broadcasters a firsthand look at conservation techniques. District officials explained land treatment at the Lakes Okabena and Ocheda Small Watershed Project near Worthington, Minn.

Conservation on the Air

by Thomas C. Gahm

By their own admission, the people who broadcast farm news have a limited knowledge of soil and water conservation.

"It's not that we're disinterested in conservation," said Jim Wychor, part owner of radio station KWOA in Worthington, Minn. "We do carry a lot of news about it. It's just that broadcasters are on the outside. We don't often see conservation projects firsthand."

In June, Wychor and other farm broadcasters representing more than 80 radio stations in eight States met in Worthington for the annual Midwest regional convention of the National Association of Farm Broadcasters. Part of their convention was a firsthand look at conservation—as guests of the Minnesota Association of Soil and Water Conservation Districts.

The theme of the tour was "How a Community Has Survived on a Waterless Prairie," and district officials guided the broadcasters through the nearly completed Lakes Okabena and Ocheda Small Watershed Project. District supervisors explained the project, from stripcropping, terracing, and other land treatment to how Worthington, a town of 11,000, depends on Lake Bella, a reservoir created as part of the project.

Worthington was thirsty before the watershed project began, district supervisors told the broadcasters. The town is on the divide between the Mississippi River and Missouri River drainage areas, and there are few dependable surface sources of water. A series of shallow wells is the only source of the 3 million gallons of water the town uses each day, and Lake Bella keeps the wells filled by helping to stabilize the supply of ground water.

Wychor, chairman of the Lakes Okabena and Ocheda Watershed Board of Managers in the early stages of the project, told his fellow broadcasters that because of the water supply Lake Bella guarantees, Worthington is no longer in danger of "drying up and blowing away."

The area's two largest food processing industries had decided to stay in Worthington because of the plans in the mid-1960's for providing the town with a stable, long-term water supply. "I don't believe they would have stayed otherwise," said Wychor.

He said that without the watershed project other large water-using industries in the town would have been forced to close last year because of the drought. There just wouldn't have been enough water to go around.

It was a working tour for the broad-

casters. Bruce Lease, vice president of the National Association of Farm Broadcasters and farm director at Worthington's KWOA, broadcasted his noon farm program live from the tour. Many of the other broadcasters carried tape recorders and interviewed Leroy Swenson, president of the State Association of Conservation Districts; Harry Major, Soil Conservation Service State Conservationist; farmers; and watershed officials on a variety of soil conservation topics. The interviews were carried on farm programs throughout Montana, North Dakota, South Dakota, Iowa, Wyoming, Nebraska, Wisconsin, and Minnesota.

"Conservationists can be an important source of news and information for farm broadcasters," said Swenson, "and there is absolutely no doubt that they can help us reach the public with our programs by making soil and water conservation more visible. I hope that this meeting will lead to helpful working relationships between conservation districts and farm broadcasters throughout the country."

Mr. Gahm is public information officer, SCS, St. Paul, Minn.

One of the sources of pollution that PLUARG is investigating is lakeshore erosion



An interview with Norman A. Berg,
Associate Administrator,
Soil Conservation Service

What's Happening to Water Quality in the Great Lakes?

When the United States and Canada established the International Joint Commission (IJC) under the Boundary Waters Treaty of 1909, their intent was to prevent disputes over the use of boundary waters. This treaty also provided the framework for cooperation on water-related pollution problems that have been growing progressively worse. In early 1972, under a United States-Canada Great Lakes Water Quality Agreement, the IJC created an International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG). Soil Conservation Service Associate Administrator Norman A. Berg was appointed U.S. cochairman. The Canadian cochairman is Murray G. Johnson, Director General, Ontario Region Fisheries and Marine Service.

At right, some 40,000 cubic yards of soil washed from a gully into the White River which empties into Lake Superior near Ashland, Wis. Below, homeowners are threatened by shoreline erosion of Lake Ontario.



Question: Stories about loss of water quality in the Great Lakes get big play in the national media. Some say that Lake Erie is dying. How bad is the situation?

Berg: There is nothing new about loss of water quality in the Great Lakes Basin. The International Joint Commission detected it in studies as early as 1912. The process had been accelerating. By the late 1960's, deterioration, especially in Lake Erie, had reached an advanced stage. That provided the big push that led to the 1972 Great Lakes Water Quality Agreement.

"Dying" is too strong a description however. The process is called "eutrophication"—an excessive buildup of aquatic weeds and algae caused by large amounts of nutrients entering the water. If unchecked, eutrophication can turn a body of fresh water into a swamp.

A major nutrient entering the waters of Lakes Erie and Ontario is phosphorus. Much of it is contained in municipal wastes, wastes from fertilizers used on farms and urban lawns, and wastes from detergents and other cleaning agents. The Great Lakes Research Advisory Board reported to the IJC earlier this year that Lake Ontario could respond to reductions in phosphorus loadings in as short a time as 8 years.

Question: How much does land use activity contribute to Great Lakes water-quality problems?

Berg: The Great Lakes drain more than 538,000 square kilometers (about 200,000 square miles) of U.S. and Canadian lands. Of this, about 59 percent is forest land, 33 percent agricultural land, and 6 percent urban development.

Intensively used agricultural lands and urbanizing areas are the most likely to produce nonpoint-source

pollutants. For urban areas, the major pollutants are excessive sediment losses from construction sites and discharges of complex wastes during periods of stormwater runoff. Urban areas occupy a relatively small portion of the basin's total land area, but they hold about 80 percent of the population and are generally located near the lakes. For agricultural areas, the major pollutants are eroded soil particles, pesticides, and phosphorus.

In addition, we believe there is a significant "fall-out" of airborne pollutants over the entire basin, including the surface of the lakes. Much of this fallout comes from outside the basin, and all of it tends to get widely distributed. These pollutants are created by burning of industrial wastes, by automobile exhausts, and by wind erosion.

Question: What can be done about these nonpoint sources of pollution?

Berg: PLUARG, the International Reference Group on Great Lakes Pollution from Land Use Activities, is trying to answer that question. I serve as the group's U.S. cochairman. We have been operating since 1972, and will file our final report with the IJC in July 1978.

Question: Who serves on PLUARG?

Berg: It has 18 members—nine from each country. They represent both Federal governments, the several States, and the Province of Ontario. The members come from a variety of institutions and government agencies with interests in education, the environment, wildlife, agriculture, and natural resources.



Barge is loaded with sediment dredged from Fox River which empties into Green Bay.

Question: What does PLUARG do?

Berg: The IJC directed us to conduct studies to answer three basic questions:

1. Are the Great Lakes being polluted from land use sources?
2. If so, to what extent, from what specific causes, and where?
3. What remedies are possible and practicable, and how much would they cost?

Question: What progress are you making?

Berg: We didn't have too much trouble with the conclusion that the Great Lakes are being polluted by a variety of land uses. PLUARG investigated urban areas; transportation corridors; mining, agricultural, forest, and recreational areas; waste disposal areas; shoreline landfills; and lakeshore and riverbank erosion.

The job of determining extent, cause and effect, and locations is much more difficult. The major land use in the basin—forestry—is not a significant threat. Intensive agricultural and urbanization activities do contribute heavily to water pollution.

Question 3 cannot be answered realistically until we have more complete answers to question 2. Some people think we should answer question 3 first. A practical remedial program at a reasonable cost could make the first two questions academic.

In its research, PLUARG has generated a wide range of technical reports and data, documentation, seminars and library aids, maps, and other materials.

Question: How do you do all this?

Berg: We divided the overall study into four tasks so that we could deal with some questions concurrently.

We designed the first two tasks to define the scope of the problem:

- In task "A," we surveyed the best information available on the effects of land use activities on water quality. We also are documenting all existing remedial measures in the suspected problem areas. PLUARG includes in this task public involvement activities (1) to create public awareness of land-use activities in the Great Lakes Basin and (2) to solicit many different opinions and views. In addition, we are doing a survey of legislation concerned with nonpoint-pollution problems in each jurisdiction.
- In task "B," we compiled an inventory of land use and land-use practices. We attempted to identify trends and to make projections to 1980 and, wherever possible, to the year 2020.

We designed the other two tasks to provide solid evidence for PLUARG's conclusions and recommendations and a scientific, credible base for further work:

- In task "C," we are intensively studying a few representative watersheds in the United States and Canada. Where possible, we will project the data onto similar lands within the entire Great Lakes Basin, relating water pollution to specific land uses and practices. Information also is being gathered on the concentration, storage, and transport of suspected pollutants.
- In task "D," we are attempting to diagnose the degree to which water quality has been impaired in the Great Lakes. We are assessing concentrations of



Top, runoff from a sloping barnyard caused pond to eutrophy. If unchecked, eutrophication can turn a body of fresh water into a swamp. Bottom, a major pollutant in urban areas is excessive sediment loss from construction sites.

contaminants in lake sediments, fish, and other aquatic resources.

Question: What are the public involvement activities in task A?

Berg: PLUARG already has launched a public information and consultation program designed to let the Great Lakes' public know what the lake problems are and how diffuse sources are contributing to these problems. The program also is designed to allow the public to react to alternative solutions.

The nucleus of the information activities is a series of public participation panels—eight in Canada and nine in the United States. Panel members represent a broad cross section of interests. They include private citizens, elected officials, leaders of special interest groups, members of the industrial community, and educators. Up to 20 people serve on each panel. We give them the information we have gathered and ask their opinions on preliminary recommendations. The contributions of these panels will weigh heavily in PLUARG's final report.

In addition, USDA's Statistical Reporting Service (SRS) is conducting personal and telephone interviews with almost a thousand farmers in the basin, asking their views on the relationship between agriculture and pollution in the Great Lakes. As part of this survey, SRS is checking to see what conservation practices are being used and why they have been adopted. A similar study is underway on the Canadian side.

Question: Why so much emphasis on public involvement?



A landowner places 2-ton rocks along the shoreline in an effort to fight erosion on Lake Superior.

Berg: Public support is vital, because few remedies will work without it. The problems are not simply environmental. They are also social, political, and economic.

Question: Isn't PLUARG likely to recommend actions that may also be recommended—at least on the U.S. side—as a result of Section 208 (Public Law 92-500) planning activities, the Army Corps of Engineers' Lake Erie Study, and the Coastal Zone Management Program?

Berg: I wouldn't attempt at this time to predict PLUARG's final recommendations. There are several other current programs with interest in nonpoint sources of pollution. Activities conducted as part of the areawide water quality management plans required under Section 208, for example, are compatible with PLUARG's. So are certain aspects of the Coastal Zone Management Program—and the Corps Study—especially those actions related to erosion and sediment reduction and environmental assessment.

The entire U.S. portion of the Great Lakes Basin is included within Section 208 planning areas. People involved in 208 planning face problems similar to those confronting PLUARG investigators—lack of good water quality data and inadequate literature on the subject, for example. The PLUARG mandate, however, is distinguished by its emphasis on water quality in the Great Lakes. Some pollution problems in upland watersheds may never affect the open waters of the lakes.

One bright spot is that water quality goals are compatible with soil and water conservation goals.

Herein lies an unparalleled opportunity to accelerate visible soil conservation while helping to improve the environment. In the United States, soil and water conservation districts are in a unique position to steer such implementation efforts.

Many Canadians have acquired similar experience from watershed and river basin programs in their country. Some of them feel that Canada could benefit from a local district format similar to ours.

Question: What action will the IJC take on PLUARG's final report?

Berg: First, IJC will schedule a series of public hearings to get additional citizen input and to develop public understanding of the problems. Then IJC will decide what recommendations to make to the U.S. and Canadian governments.

There is some concern within PLUARG over who is going to pay the costs of controlling pollutants from land use activities. We intend to make our recommendations as realistic and economically feasible as possible. But legislators, administrators, and resource users will almost certainly question program costs unless they recognize and understand the need for pollution control and the benefits to be derived from it.

Another key ingredient in a successful program will be voluntary participation. This has characterized SCS work for more than 40 years. Many of our goals would be unattainable without it.

In the end, the strength of any public commitment could depend upon how valuable a resource the general public feels the Great Lakes really are.

Below, severe erosion was a problem before installation of an inlet to one of the reservoirs. Right, the reservoir has a 90 acre-foot storage capacity. After 10 years of hard work, area farmers have a dependable water management system.



by Kirk G. Heaton

Long Battle for Short Creek

For more than 50 years, farmers in Colorado City, Ariz., struggled to make the best of a limited water supply. Now they have a water management system to help them.

People in Arizona make good use of water, yet its development and management are a continuous battle.

People in the northern Arizona farming community of Colorado City know what's needed to win the battle for water. Their only aboveground source of water is Short Creek, a tributary of the Virgin River. Surface water flows in the creek only intermittently—about 30 days each year—triggered by snow-melt and summer storms in Utah's Canaan Mountains, by infrequent local storms, and by even less frequent local flash floods.

Colorado City's early settlers recognized Short Creek's potential for irrigation water, but the question was how to develop it.

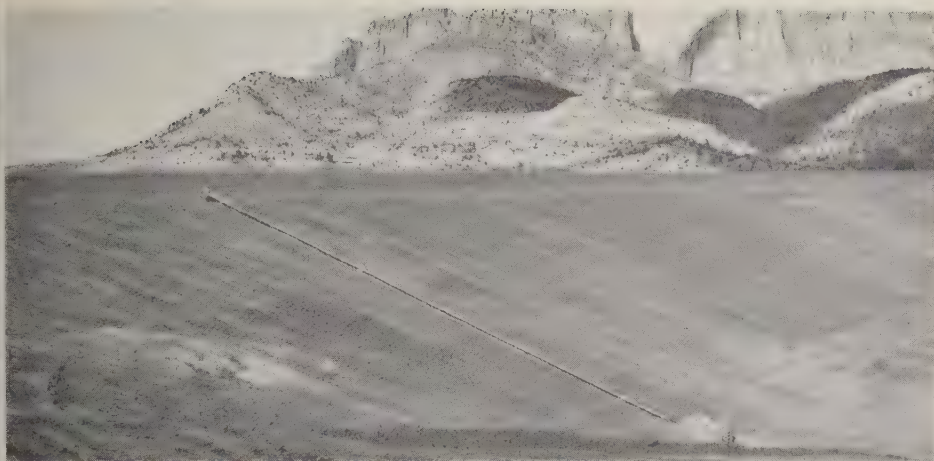
In 1928, residents formed an irrigation district and established a water right on the creek. But, the amount of

irrigable land involved and the size and flow of the creek didn't qualify the region for Bureau of Reclamation funds for water development. So, for 40 years, farmers struggled to build their own irrigation system.

Dan Jessop, who came to Colorado City with his parents in the early 1930's, said, "It was frustrating to see the creek flow right past all our farms and not be able to control it and store the water.

"In 1932 and again in 1941, we almost got water to our fields through a hand-dug diversion ditch. It was a co-operative effort: every able-bodied man and woman in town helped to dig the ditch. Eventually landslides and trash in the runoff blocked the ditch so badly that we had to abandon it."

In 1967, after a small diversion dam had washed out several times, farmers



A gated outlet structure with a stem and debris guard was included in the construction plan.



Water is sprayed to compact clay used to fill 70-foot deep core trench for one of the reservoirs.

Blocks in a concrete chute reduce water speed, solving erosion and sediment problems.

asked the Fredonia Natural Resource Conservation District for help in designing and constructing a permanent water development and management system.

The Soil Conservation Service, working through the conservation district, provided technical assistance, and the Agricultural Stabilization and Conservation Service helped finance the project.

Clifford Parsons, SCS area engineering specialist at Prescott, Ariz., developed a 5-year construction plan for the diversion, storage, and delivery of water from Short Creek to local farms.

The main features of the plan included a semipermanent diversion dam, a special sluiceway, 2 miles of irrigation diversion channels, two storage reservoirs, and more than 10,000

feet of irrigation pipelines. Seven existing irrigation wells and their sump were also included in the plan.

The reservoirs have a combined capacity of approximately 170 acre-feet, and the sprinkler system irrigates 300 acres of cropland. Flood and fire protection are added benefits.

Constructing the system made special demands of Colorado City's farmers. "We weren't contractors or heavy equipment operators," Dan Jessop explained, "and we couldn't afford to hire experienced people to do the work. We asked for bids on some phases of the project, but the bids far exceeded our means. So we did the work ourselves, with heavy equipment that we borrowed from the conservation district."

It took almost 10 years to complete the water management system, and

Clifford Parsons marvels at Colorado City farmers' ingenuity and determination.

"They worked through the heat of summer and subzero winters to get the job done," Parsons said. "When heavy equipment broke down they repaired it on the spot."

"The cost per acre-foot of water that we're able to store and use with this system may seem high," Jessop said, "but knowing we can get water when we need it is well worth the cost."

Mr. Heaton is district conservationist, SCS, Fredonia, Ariz.



by F. Dwain Phillips

Learning Inside and Out

Oklahoma and its conservation districts invest time and money in conservation education for big environmental dividends.

Oklahoma supports conservation education statewide. The Pontotoc County Conservation District brought attention to the State effort in 1976 when it won the national NACD-Allis Chalmers Environmental Education Award.

The district's program included funding minigrants for school projects, developing outdoor classrooms, and hiring an environmental education specialist to help individual teachers and schools prepare a course of study for their students and to help them with special projects. The district, in cooperation with a local university, also helped organize a summer course in environmental studies for teachers.

Pontotoc County's program is a good example of what can be done in conservation education by districts. Much is also being done at the State level.

The Oklahoma Conservation Commission helps fund the salaries of two conservation education specialists who help schools in districts throughout the State. It also helps fund minigrants and other programs.

Conservation education is important to the Oklahoma Association of Conservation Districts, too. It actively supports many district programs like the ones in Rogers, Logan, Payne, and Tulsa Counties.

The Rogers County Conservation District gave \$1,000 toward developing the Oologah outdoor classroom. It furnished materials for other outdoor

classrooms and assigned resource people to help with the projects. Speaking for the district, Chairman Waldo Funk says, "We should have done more to educate our young people years ago. Helping them to understand the environment and learn how to protect our natural resources is good for all of us."

Districts in rural communities are not the only ones working on conservation education. Tulsa County Conservation District—which serves Tulsa, the second largest city in the State—reaches an estimated 7,000 students each year with its conservation education activities. This year the district gave six sets of soils monoliths to schools to use in their lessons on soils and helped 10 schools start outdoor classrooms.

For several years Logan County Conservation District has organized and helped support a 1-week conservation camp for sixth graders. The children have an opportunity to go outdoors to learn about the environment. They study soils and plants with the help of soil scientists, woodland conservationists, range conservationists, and other resource specialists from the Soil Conservation Service, Oklahoma Wildlife Department, Oklahoma Forestry Department, and other agencies.

Payne County Conservation District helps organize and support an environmental studies program at the



Left, (standing, left to right) John Mills, principal of Stillwater Middle School; Don Jackson, district conservationist, Stillwater; (sitting, left to right) Margaret Swank, Payne County Conservation District board member; Robert Hale, superintendent of Stillwater Middle School; and Terry Shaw, teacher at Stillwater Middle School, review plan for 3 days of outdoor activities at Camp Redlands a few miles from Stillwater. Below, three students at Camp Redlands perform water studies.



Stillwater Middle School. Each year sixth graders spend 3 days at Camp Redlands on Lake Carl Blackwell studying soil, water, and other resources.

Some districts sponsor essay, poster, and speech contests. Others hold conservation fairs and give awards for displays and projects. Since 1946, Oklahoma districts have sponsored an annual land judging contest for Future Farmers of America and 4-H chapters.

Several conservation districts in the State have formed youth boards, made up of high school students who attend conservation district board meetings, organize conservation projects, and study conservation practices in their counties.

More than 200 outdoor classrooms have been established throughout Oklahoma. Clair Fickett, chairman of the Tulsa County Conservation Board, and most other district leaders feel that working with schools and universities will pay environmental dividends.

Mr. Phillips is public information officer, SCS, Stillwater, Okla.



Members of youth boards from Valliant and Guthrie, Okla., tour a strip mine in the eastern part of the State.

Students in southern Illinois no longer have “flood drills,” thanks to a levee that solved their school’s flooding problems.

by Robert E. Craft

No More Flood Drills



Heavy rains do not alarm the students at the Egyptian Community Unit School in Mounds, Ill. The 950 youngsters stay in their classrooms and continue studying, undisturbed by the falling rain. But it hasn’t always been that way.

Not long ago, flood drills were as common as fire drills at Egyptian. At the sound of a bell, all the students from kindergarten through 12th grade filed through the halls and onto the gymnasium stage and bleachers—the two highest points in the school building.

There was a good reason for these drills. The school had been flooded in 1971, and during Memorial Day weekend in 1973, floodwaters rose to 32 inches throughout the building.

After the water subsided in 1973, 4 inches of sediment covered the floors, and over \$300,000 of damage had



Above, Barry Gowin (left), Egyptian School superintendent, and Ed Pawlisch, district conservationist, review plans for RC&D flood prevention measure.

Left, after a flood in 1973, 4 inches of silt covered the school floors—over \$300,000 of damage had been done.

been done to books, furniture, equipment, and the school building itself.

After that, flood drills were routine and plans for flood prevention became a priority at Egyptian.

"Now," according to Barry Gowin, Egyptian school superintendent, "we don't need to have our students file to the gym to be safe from floodwaters, thanks to the community improvement project of the Shawnee Resource Conservation and Development (RC&D) Area."

Working through the Shawnee RC&D Area, the Soil Conservation Service prepared an engineering and environmental plan for protecting and improving the school and the local resources.

The Pulaski-Alexander Soil and Water Conservation District, the Egyptian Community Unit School District No. 5, and the Illinois Division of

Transportation's Division of Water Resources took part in the project.

Today, a levee 7 feet high surrounds the Egyptian school building. It has wide, gently sloping sides, and protects the school against flooding.

A few parents were against the flood protection project because they thought the levee would make the building look like it was set in the middle of a big hole. "Avoiding that was one of the main objectives in designing and building the levee," explains SCS District Conservationist Ed Pawlisch.

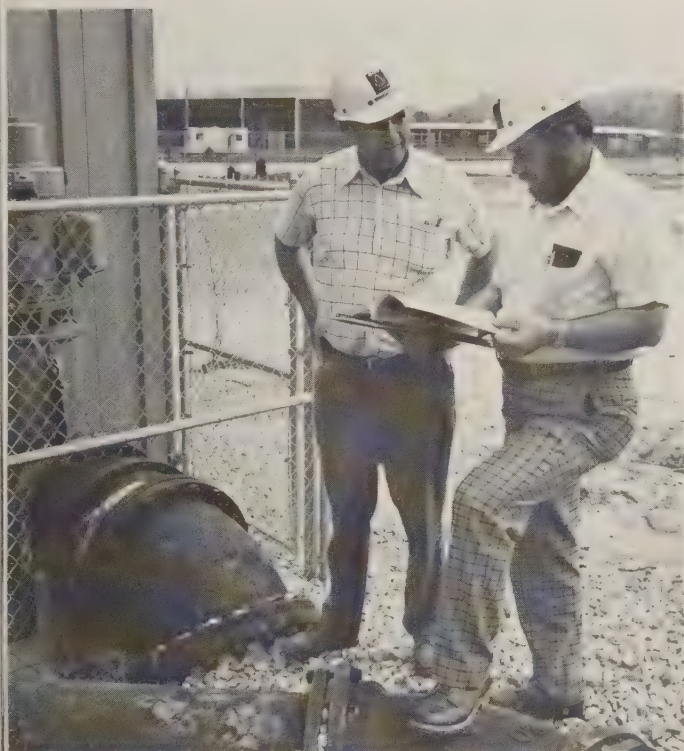
The parents are all in favor of the results. The wide banks of the levee were shaped to blend with the surrounding landscape and planted with more than a thousand trees and shrubs.

Additional benefits of the flood protection project are the numerous trees and shrubs planted in patterns that

make it easy to use the scenic surroundings as outdoor classrooms. Also, wildlife are attracted to the natural settings.

The total cost of the project was \$587,000. School Superintendent Gowin believes the project is invaluable: "In March of this year we had heavy rains again. In one downpour, 7 inches of rain fell. Without the levee, there would have been close to 24 inches of water inside the school. But with the levee our students were safe and the school stayed dry."

Mr. Craft is public information officer, SCS, Champaign, Ill.



Edward Masterson (left) and Thomas Poston, SCS construction inspectors, review construction plans.



Flood control measures at Egyptian School include a concrete drop structure and pipe outlets. Riprap prevents streambank erosion.

Tammy Kinnebrew uses a conservation plan for managing his woodland and saves hardwoods for wildlife.

by Earl J. Garber

A Close Look at Tree Harvest



"Knowing where every tree is and where it's going during and after harvest is the only way to make money growing trees," said Tammy Kinnebrew as he monitored timber harvesting on his pine plantation near Homer, La.

Kinnebrew, a semiretired lawyer, has been cooperating with the Saline and D'Arbonne Soil and Water Conservation Districts since 1949. In fact, he displays in his office conservation plans the Soil Conservation Service helped him develop for his farm.

Beginning in the fall of 1976, Kinnebrew thinned nearly 300 acres of loblolly pines—the first thinning of more than 300,000 trees he planted in 1959 and 1960. He used a combination of ideas from SCS, the Louisiana Experiment Stations, and other sources in thinning the stand.

"I began by removing every third row of trees," Kinnebrew said. He found, however, that this left his plantation easy prey to ice damage during the winter. He tried removing every fifth row, but the results still didn't satisfy him. Kinnebrew then decided to remove every seventh row and thin the remaining rows to a D+6 spacing, leaving a space equal to the average diameter plus 6 feet between each tree.

"I think it is better to remove fewer trees on the first round and come back

with a second thinning sooner," he explained. "Since a certain number of trees will be lost to natural causes like ice damage, why increase the losses by removing too many trees?"

Kinnebrew also owns almost 700 acres of native pines and hardwoods. He uses the D+6 spacing in harvesting the native pines for pulpwood and sawlogs, but he refuses to cut any hardwoods on his farm because of their value to wildlife.

Kinnebrew marks most of the trees to be cut himself. He doesn't mark more than 1 day ahead for the pulpwood cutters so he is always working in the same area as the cutters.

Kinnebrew employs a crew who cut pulpwood only for him. "This way I can control the size of the equipment and the rate at which they harvest," he explained. The cutting goal for an average week is 90 cords, using three trucks that each haul 6 cords a day.

By letting a wood company estimate the amount of timber in the stand, bid on it, mark it, and cut it, Kinnebrew could get \$2 or \$3 more a cord. He believes, however, that he is saving by harvesting only those trees that are not suitable for producing sawlogs and by reducing damage to the remaining trees.

"I generally have an agreed-to price per cord, or per thousand board feet, with the woodyard. I feel that this

method is better than estimating the volume and contracting a sale because there is no guesswork involved," Kinnebrew said.

"My method of harvesting timber may not fit small landowners, but this is where a cooperative is needed," he continued. "The small landowners must get together and pool their resources. A cooperative would aid not only in harvesting but also in marketing their product."

Kinnebrew recommends that tree farmers with small as well as large operations request technical assistance from their local soil and water conservation district, SCS, and State Forestry Commission. But, he added, "A tree farmer has got to stay close to his crop, especially when it's being harvested. If not, carelessness could mean the difference between profit and loss."

Mr. Garber is district conservationist, SCS, Ville Platte, La.

Virgin Islanders Compete to Aid the Environment

by William G. Saalman III
and Carol F. Smith

Recent legislation in the U.S. Virgin Islands is living up to its popular name, "Earth Change Law."

Urged on by the Virgin Islands Conservation District, which received technical advice from the Soil Conservation Service, the legislature passed the 1971 Environmental Protection Law to control development in the islands.

Soil and water conservation is especially needed in the three main islands—St. Thomas, St. John, and St. Croix—because of the steep, hilly terrain and lack of a generous natural water supply. Recent development has shifted natural drainage patterns and increased flash flooding and the amount of sediment deposited in natural drainageways and low areas.

Under the new law, landowners planning any development must agree to carry out conservation measures to keep erosion at a minimum, protect existing vegetation, deal with storm drainage, and conserve surface runoff. Only then will the district or the Department of Conservation and Cultural Affairs issue them an earth change permit. SCS assists with planning and gives technical advice on installing conservation measures.

In 1976, popular support for the law increased with the first annual awards for outstanding conservation measures. Winners were selected by the conservation district and the Virgin Islands Resource Conservation and Development Council.

The 1977 awards went to eight winners in the following categories: single-family residence, hotel-condominium, government, commercial/business, subdivision, industry, and special. Each winner receives a plaque, and photographs of the event are used in newspapers and

Meetings:

November

6-9	Irrigation Association Convention, New Orleans, La.
7-9	Geological Society of America, Seattle, Wash.
8-11	Future Farmers of America, Kansas City, Mo.
13-16	National Forest Products Association, San Diego, Calif.
13-17	American Institute of Chemical Engineers, New York, N.Y.
13-18	American Society of Agronomy, Los Angeles, Calif.
13-18	Soil Science Society of America, Los Angeles, Calif.
14-22	The National Grange, Greensboro, N.C.
15-16	Purdue Air Quality Conference and Exhibition, Indianapolis, Ind.
23-26	National Council for Geographic Education, St. Louis, Mo.
29-Dec. 1	Western Forestry and Conservation Association, Seattle, Wash.
30-Dec. 2	Keep America Beautiful, Inc., National Meeting, New York, N.Y.

December

4-6	American Society of Farm Managers and Rural Appraisers, Inc., Denver, Colo.
5-9	American Geophysical Union, San Francisco, Calif.
12-13	Erosion and Sedimentation Symposium, Chicago, Ill.

January

3-6	Catfish Farmers of America, Atlanta, Ga.
8-12	American Farm Bureau Federation, Houston, Tex.
8-12	National Council of Farmer Cooperatives, San Francisco, Calif.
9-13	North American Game Breeders and Shooting Preserve Association, San Antonio, Tex.
17-21	National Wool Growers Association, Inc., Denver, Colo.
24-26	National Cattlemen's Association, New Orleans, La.

in a conservation exhibit at the annual Food and Agriculture Fair.

"People like to be recognized for their efforts," said Clifford Benjamin, the conservation district chairman. "Our award winners have all helped significantly to enhance and protect our tropical environment."

With the support of the Virgin Islands Conservation District, more than 3,300 Earth Change Permits have been issued on the islands by the Department of Conservation and Cultural

Affairs since the law first took effect in October 1972. An estimated 2,500 acres have been affected by the conservation program.

Mr. Saalman is district conservationist, SCS, St. Croix, V.I.
Ms. Smith is clerk-typist, SCS, St. Croix, V.I.

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A New Chance to Heal the Land

From the Administrator

The new surface mining law is good news for SCS, conservation districts, and other concerned groups working to improve land and water quality.

The Surface Mining Control and Reclamation Act of 1977 provides protection for important agricultural land and establishes a program to reclaim abandoned coal mined land.

SCS and conservation districts have sound experience in mined-land reclamation. SCS has developed plants that grow on mine spoils, conducted soil surveys, drawn up conservation plans, recommended engineering techniques, and advised on water-quality problems. Districts have emphasized the need for technical and cost-sharing assistance, reviewed plans and programs, and in some cases actually carried out the reclamation with their own equipment and crews.

Mine operators and State agencies will need data quickly, especially about prime farmland. We already are accelerating soil surveys and the prime farmland inventories based on them. SCS State conservationists already are helping address prime farmland requirements in mining permits. Plant materials centers are stepping up their search for plants that grow on land disturbed by mining.

The 1977 law also calls for States to enact and enforce programs to regulate closely the future surface mining of coal.

Many States already have surface mining laws and active voluntary and regulatory reclamation programs. SCS is helping State and Federal agencies develop reclamation standards that meet the requirements of the new law. We also will help train the people who do the mining and reclamation work and the people who will review it later.

Landowners as well as mine operators will need professional assistance during reclamation. SCS is ready to help them.

Districts and SCS need to review priorities for mined-land reclamation, and help design coordinated programs that are specific to each site's physical condition, adjacent land uses, and landowner objectives.

America must harvest its coal resources to meet energy demands. Under the new law, SCS and districts will help heal the scars of the past and assure that new mining operations will not endanger public health, safety, and welfare and the rural landscape. It is a big challenge, but an important opportunity.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

From 1937 to 1977—changes can be seen in farm country in southern Pennsylvania as conservation practices are installed on the land. See pages 11 through 14. (Photo, Donald C. Schuhart.)

Soil Conservation

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Revegetation in the Rockies

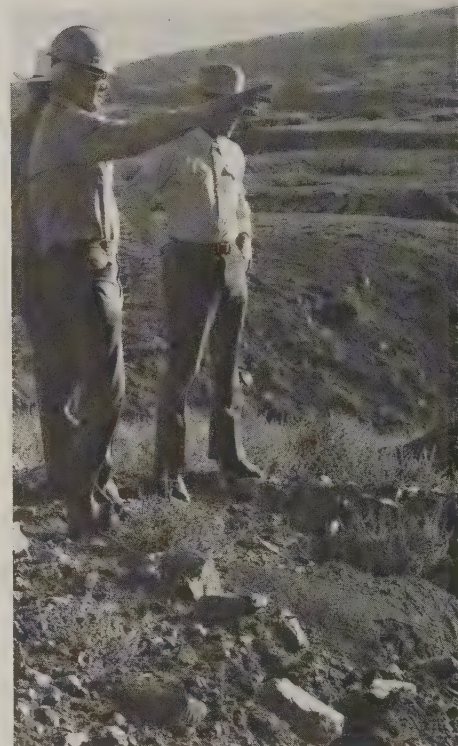
by Josh Whetzel
and Charles Hogelin

Beginning with a soils and vegetation inventory, a Colorado mining company developed a conservation plan that includes land reclamation and range management.



At the Edna Mine site, the growing season is about 120 days and the average precipitation is 17 inches a year.

District supervisors view reclamation work at the mine site.



Revegetating mining sites at high elevations in the Rocky Mountains is difficult; but with a conservation plan and perseverance, a Colorado mining company is reclaiming the land.

The Pittsburg and Midway Coal Mining Company is revegetating at its high elevation strip mine near Oak Creek, Colo. Its Edna Mine is situated at an elevation of 8,000 feet, with a growing season of approximately 120 days and an annual precipitation averaging only 16 to 18 inches.

In fall 1973, the mining company asked the Routt County Soil Conservation District (SCD) Board of Supervisors and Soil Conservation Service personnel to view the mine site and operation and to make recommendations for equipment, seedbed prepara-

tion, and seed mixtures of grasses, forbs, and shrubs for revegetation.

The SCS plant materials center at Los Lunas, N. Mex., developed seedling mixtures of native and other adaptable species suited to the Edna Mine site. In fall 1974, promising species of grasses and forbs were planted in small test plots on the graded mine spoil and in spring 1975, several test plots of trees and shrubs were planted.

In order to organize Edna Mine's land use activities, the mining company asked SCS, through the Routt County SCD, for assistance in developing a conservation plan. In fall 1975 as the first step toward developing the plan, SCS inventoried the soils and native vegetation of the areas to

be mined. The soil survey provided information about soil location, depth, texture, pH, conductivity, and permeability. The vegetation inventory listed plants by specific sites and the estimated total annual production.

In early 1976 after completing the inventory, SCS and mining company personnel developed a conservation plan which included land reclamation and range management. The company used the soil survey to identify good sources of topsoil which could be saved during the mining operation. Using the vegetation inventory, the company selected native species such as western wheatgrass, slender wheatgrass, mountain brome, big bluegrass, green needlegrass, serviceberry, chokecherry, and antelope

Conservation Has a Leading Role in Reclamation Act



The soil survey identified good sources of topsoil which could be saved during the mining operation.

New Federal rules governing surface mining took effect in August when President Carter signed the Surface Mining Control and Reclamation Act of 1977.

Mining companies strip 48,000 acres of land a year, and Public Law 95-87 will require them to restore surface mined land to a condition capable of supporting its previous use.

Reclamation involves planning and site preparation before mining, stabilization and conservation during mining, and restoration when the mining is finished. Restoration includes grading the land to its original slope, reconstructing the soil, planting vegetation for cover, building terraces, and installing other conservation measures to stabilize the soil and control erosion. The Soil Conservation Service, through conservation districts, will help surface mine operators develop and apply their reclamation plans.

Public Law 95-87 also has special requirements for mining on prime agricultural land. Operators will be permitted to mine prime farmlands only if they prove that they can reclaim the land to its previous level of productivity. They must also follow strict soil reconstruction standards.

A company applying for a mining permit that involves prime farmland must present a soils map that identifies all units of prime farmland in the area to be mined. Soil surveys help determine prime farmland and can be used as a guide to reconstructing the soil after mining. The surveys must, however, be prepared in accordance with the National Cooperative Soil Survey.

For the first time, under the new law, farmers, ranchers, and other surface owners will be able to veto new surface mining operations on their land even if they do not own the mineral rights, giving them a stronger say about mining operations that may disrupt their homes or livelihoods.

The law also authorizes USDA, through a voluntary program, to provide technical and financial assistance to rural land users on the 1 million acres of presently unreclaimed coal mine land. Federal cost sharing for the "abandoned" lands will be provided under long-term contracts based on conservation plans. Cost sharing will average 80 percent, but higher rates will be authorized when needed for reclamation that would benefit the public. The Soil Conservation Service, through the conservation districts, will help rural land users develop and carry out the conservation plans.

To fund abandoned mine reclamation, mining companies will pay fees for surface-mined coal and coal from underground mines for the next 15 years—35 cents per ton on surface-mined coal (10 cents for lignite coal) and 15 cents per ton on coal from underground mines.

Implementation of the new law will be phased in over the next 3 years as States develop regulatory programs that meet the requirements of the act. In States that do not develop adequate State programs, federal regulatory programs will be implemented.

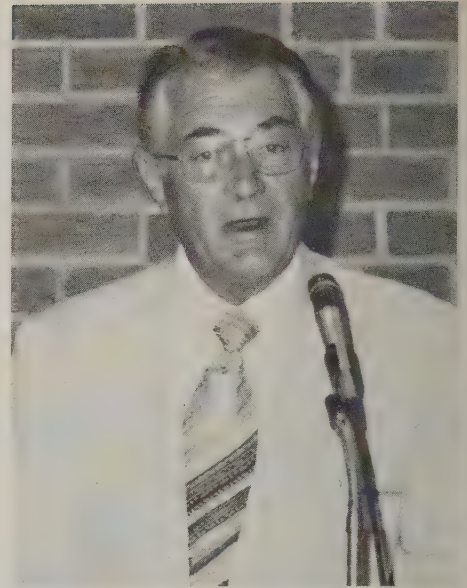
The Office of Surface Mining, U.S. Department of the Interior, will administer the law.

bitterbrush to be included in seed mixtures planted at specified sites.

Since the company wanted to use the reclaimed land for domestic grazing, range management techniques were included in the conservation plan. Newly seeded areas are protected from domestic grazing by fencing which does not interfere with mining operations. After the plants are established and animals begin grazing, no more than 50 percent of the current year's growth will be grazed.

Mr. Whetzel is reclamation specialist, Edna Mine, Oak Creek, Colo.
Mr. Hogelin is district conservationist, SCS, Byers, Colo.

Abridged remarks made by Mr. Bagley, St. Joseph, La., farmer and president, National Association of Conservation Districts (NACD), at the Annual Conference of SCS State Conservationists, San Diego, Calif., September 1977. Mr. Bagley's appearance marked his last as NACD president before a State conservationists' meeting.

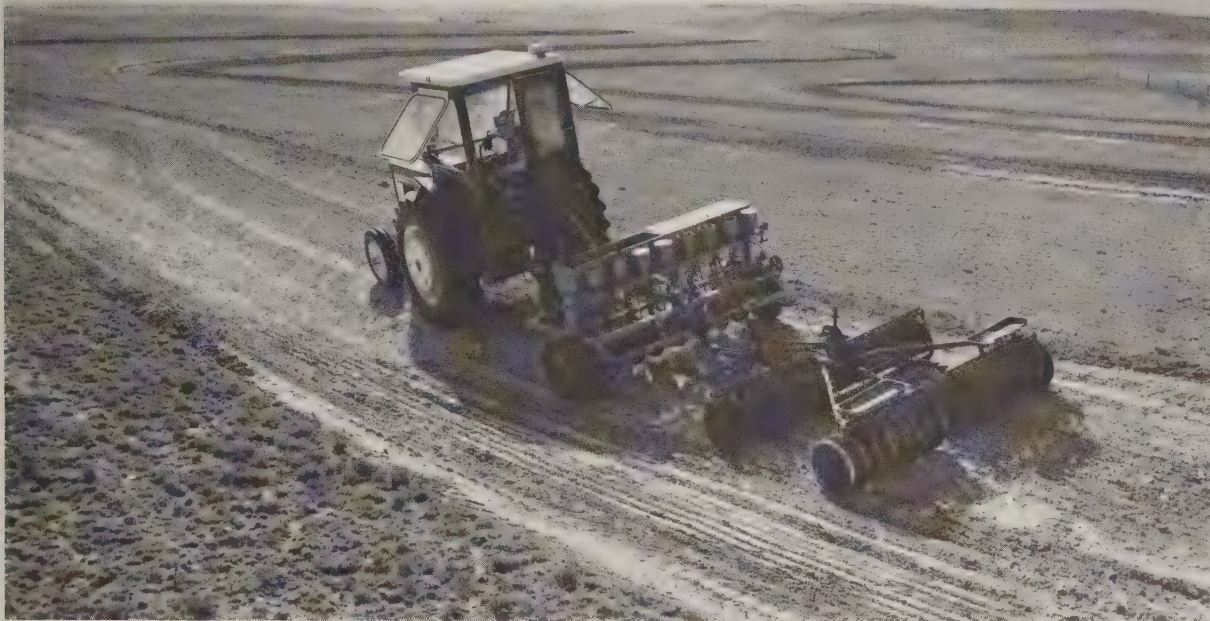


Soil Conservation Today and Tomorrow

by George R. Bagley

There has been nothing quite like the creation of districts in the history of our Nation. We invented a whole new series of local governments charged with preventing erosion and conserving soil, and they rapidly proliferated throughout every State, Puerto Rico, and the Virgin Islands. America can be proud of her 3,000 conservation districts and the 17,000 men and women who are stewards of their affairs. America can be proud of the record of conservation established on the land through districts and the Soil Conservation Service, and through related and cooperative efforts of others, that have helped to repair the ravages of past neglect and misuse.

Over the past four decades, conservation districts have grown in stature as well as geographical coverage. In response to the change in interrelationships between natural resource problems, our programs have evolved in many new directions. We have placed more emphasis on managing water on farms and small watersheds. We've adapted conservation technology to assist with recreational and economic development in rural areas. We've used the principles and techniques of erosion control to help reclaim strip-mined lands. We've developed programs to assure control of erosion and sedimentation at construction sites. We've helped develop procedures to coordinate the con-



servation planning and treatment of intermingled public and private lands.

Districts formed organizations at the area, State, and national levels during these years in order to help accomplish their purposes. We sought assistance from every available source, and secured funds and employed personnel to supplement those furnished by SCS and other cooperating agencies. Repeatedly, State legislatures and county governments have provided districts with additional authorities and fresh resources to strengthen our work.

Today, districts are better financed, more powerful, more effective, and more representative of their constituencies than ever before. We have a broader view of our responsibilities. We are stronger and more independent.

And we are more controversial. Contrary to what some people think, soil conservation has always been somewhat controversial. Districts did not spring into being automatically. There was debate aplenty over the early years, and it was hot debate. The idea of soil conservation implied dissatisfaction with the status quo. That's always controversial, and some of the battles over district organization were fierce.

After these stormy beginnings, soil conservation assumed the stature of motherhood and the American flag. Everybody seemed to be for it. The

Conservation practices must be responsive to changes in agricultural technology . . . heavier, larger equipment means that the design of structural practices must be modified.

backlog of work on the farms and ranches of the country was enormous, and district leaders and their helpers got down to the job.

But it didn't take long for districts to recognize that proper soil conservation involves more than farm planning, contour stripcropping, and timber stand improvement. It also involves the relationship between rural and urban areas, between economic existence and resource preservation, between private property rights and public interests, and between the people and their government.

Increasingly, therefore, conservation districts have spoken out on major issues of concern. They have expressed their views on land use planning and the appropriate roles of the various levels of government in this highly controversial process. They have defended the use of water management structures, including reservoirs and channel modifications, where their overall benefits appeared to outweigh disadvantages. They have spoken against blanket Federal regulations dealing with land use and wetlands

preservation. They have spoken out in favor of accelerated efforts to control water pollution from land disturbing activities. And they have spoken out forcefully on a wide variety of issues affecting the public lands of the Nation.

Districts have tried to stand for what they believe is right, and for what they believe to be a balanced, common-sense approach to conservation. They have not always agreed with environmentalists about some of their conclusions. Instead, they have tried to balance the need for economic existence with that for environmental protection.

Controversy over soil conservation and conservation districts has tested and strengthened our mettle. It has helped make the public aware of the choices we face and the issues that we must confront. And it has helped prepare us for the challenges we face today as conservationists. We are at an important crossroads in the history of conservation and the directions that we take now will set the course for soil conservation tomorrow.



Top, a lake in Kentucky, which was once a coal strip pit, now supports fish. Bottom, a small debris basin traps sediment at a construction site in Virginia.

We've used the principles and techniques of erosion control to reclaim strip-mined lands and we've developed programs to control erosion and sedimentation at construction sites.

Three years ago, we warned the Nation that releasing land previously held back from production for agricultural use could lead to vastly accelerated erosion. A year later, our Great Plains Committee reported widespread and promiscuous plowing of grasslands. SCS reported that more intensive use of existing cropland and conversion of lands to more intensive cropping was resulting in dangerously high erosion levels in many parts of the country. This year, dust storms swirled through the Plains and across the East to the Atlantic Ocean. Terraces and contour strips have been plowed out in many cases. Windbreaks have been removed.

Many of the predictions of SCS and NACD about erosion damages, despite efforts to achieve "production with protection," as the slogan goes, have come true.

The key issues in conservation districts that I see for today and tomorrow are:

Priority establishment

The days of first-come, first-served,

wall-to-wall approaches to conservation are numbered. Setting priorities for conservation planning and treatment is primarily the responsibility of conservation districts. Given limitations on manpower and other resources, it will always be impossible to do everything. In many districts, intensive effort is being made to determine which problems are the most critical and to concentrate available resources on those problems. But, in far too many districts, the program adopted each year is a repeat of what was done the previous year.

Conservation districts and SCS need to take the initiative together for a fresh inventory of erosion, sediment, forestry, water conservation, and wildlife problems in each district today to serve as a basis for the district officials' establishment of priorities.

Adequate technical assistance

The problem of priorities goes beyond the exercise by districts of their responsibilities under Memorandums of Understanding with USDA and other agencies. Increasingly, large amounts



Two areas that districts and SCS consider when setting priorities are forestry and wildlife habitat needs.



of time of technical personnel assigned to districts are consumed by activities not subject to district priority assignment.

For a variety of reasons, the amount of technical assistance available to districts for assistance in establishing conservation measures on the land has shrunk. Personnel ceilings, inflation, paperwork, and additional mandated responsibilities have combined to diminish time available to help landowners in the field.

Current efforts by SCS to reduce paperwork and get technicians back in the field are to be applauded. Other means of supplying needed technical services should be explored. Districts need to expand their own technical staffs to help fill the gap. Districts need State and local monies as well as Federal monies to do the job.

Onsite technical assistance has been the key to much of the success of district programs. This insures that conservation treatment is tailored to the problem, in the conservation plan, and that sufficient encouragement and assistance can be given to assure completion of planned measures.

Improved planning and followup procedures

Conservation plans are the basis of our work because they match conser-

Conservation districts and SCS need to take the initiative together for a fresh inventory of erosion, sediment, forestry, water conservation, and wildlife problems.

vation treatment with land capabilities. Plans should be comprehensive enough to insure that all aspects of land treatment fit together in the overall management scheme and all resource needs are taken into account.

The basis for these plans is soils capability. It is custom tailoring for the individual land owner or operator. The conservation plan is the biggest sales package SCS and districts have going for them.

Whatever improvements may be made in conservation planning, they will come to naught without adequate followup. Here is where the district and the technical agencies assisting them share responsibility. Once a plan is prepared, specific attention should be given to steady, persistent encouragement of application over the years.

Updated conservation measures

Conservation practices must be responsive to changes in agricultural technology, economics, and emerging conservation objectives. Heavier, larger equipment means that the design of structural practices must be

modified. Growing emphasis on reduction of pollution means that the effects of erosion control measures on water quality must be determined. Conservation tillage systems may make some conservation measures less important as technology progresses.

An upgraded research and development program to test and adapt conservation measures to present-day conditions and objectives is sorely needed.

Improved cost sharing

The principle of public investment to share the cost of establishing conservation measures that benefit the public more than individual landowners has long been accepted. But in too many cases, programs have combined objectives of conservation and income augmentation, with resultant confusion. Too much emphasis has been placed on short-term practices and too little on permanent, enduring conservation measures.

The best approach, we remain convinced, is to tie together technical assistance and cost sharing through



Left, SCS employees provide varied technical help to farmers and ranchers. Below, the basis for conservation plans is soils capability.



Onsite technical assistance has been the key to much of the success of district programs. It insures that conservation treatment is tailored to the problem.

long-term contracts. This helps assure step-by-step accomplishment of all needed measures in accordance with an appropriate plan and schedule.

Maintenance of conservation measures

Once conservation practices have been installed, what can be done to insure that they will continue in use over the years? Should there be a requirement that practices be maintained, or, if modified, replaced with something of equal value in conserving soil and water resources?

Environmentally sound projects

There can be no question that special projects sponsored by conservation districts, such as watershed and resource conservation and development projects, should be planned and carried out in a way that enhances the overall environment. This requires multidisciplinary planning, adequate public participation, recognition of all economic and environmental costs and benefits, and maximum use of nonstructural measures in dealing with

water management—including land treatment, floodways, and flood plain protection.

The legislation is on the books to accomplish these objectives and some progress is being made. But nonstructural work will not be accomplished if funds are not made available. Land treatment will not be accomplished to the degree desirable if provisions authorizing long-term contracts are not funded.

These are some of my thoughts on the challenge that districts face today. These issues and others are being studied now by NACD's Committee on District Outlook. Out of this study, and the ideas that you can contribute at this meeting, will come some recommendations for action. We need a new Conservation Agenda for the eighties.

I don't believe that anybody is going to come up with a wholly different approach to the problem of soil conservation. Basically, our program is sound. Many of the criticisms that are being voiced today are similar to those that have been made within NACD for

years. So are many of the prescriptions for change.

But the time is ripe for a new national commitment to the subject. The time is ripe for a new national determination to do those things—at the local, State, and Federal levels—that will help identify our critical soil conservation problems and concentrate on efforts to achieve the most permanent solutions possible.

Never has there been more interest in conservation, and soil and water conservation in particular. Let's benefit from this public interest and let it help us reaffirm the best in our programs and make the further changes that will enable us to conserve our land's resources for today and tomorrow.

Written on the Land

Aerial photos of a farming community in Pennsylvania reveal the story of steady environmental improvement over the last four decades of the conservation movement.

Top, in 1937 photo, rectangles and triangles of land, with straight furrows in fields, give no hint of the steep, rolling country below in Lancaster County, Pa. Erosion of topsoil was heavy during rainstorms. Bottom, in 1977 photo, cropland has been shaped to follow the contour of the land. Natural drainageways are in sod to prevent gullying.



In 1937, an aerial photographer on a mapping assignment for the U.S. Department of Agriculture took a picture of some 2,400 acres of farm country in southern Pennsylvania. Located around the village of Chestnut Level in Lancaster County, it was typical of many American farm communities of the 1930's. Fields were plowed in straight lines, even up and down hill-sides, just as they had been since the 18th Century. When it rained, there were heavy losses of topsoil, amounting to many tons of soil per acre.

But 1937 was also the year of the founding of the Lancaster Soil and Water Conservation District, one of the first such local districts in the United States. The Soil Conservation Service, a USDA agency established 2 years earlier, started providing technical help to farmers through the district.

Farmer after farmer signed up voluntarily as a "conservation cooperator," and farm by farm, the look of the land began to change. A new vocabulary of conservation farming began to be written on the land: contour plowing, stripcropping, grassed waterways, crop rotation, and terracing. Today the Lancaster District is still in business, along with some 2,950 other soil conservation districts across the country; and a recent aerial photo of the same farming community reveals the extent of the change that conservation farming has wrought on the American landscape.

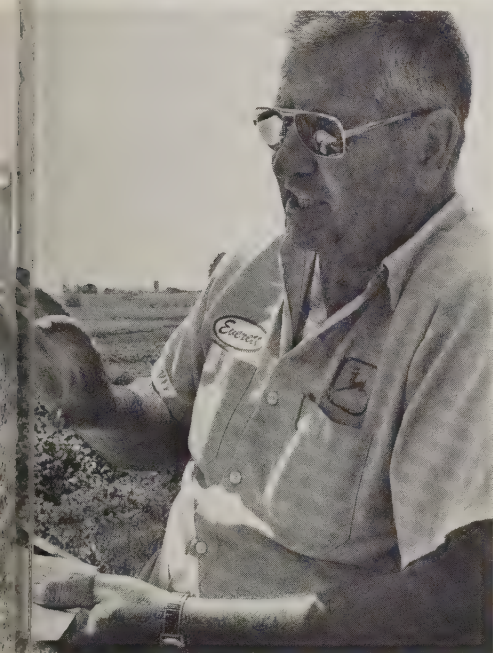


Everett Kreider (on tractor), owner of two farms near Chestnut Level, discusses plans with Abner Houseknecht, a district employee. Before he retired from SCS, Houseknecht helped develop many of the farm conservation plans now applied in the area.





What is seen as a pattern of curves from the air is revealed on the ground as strips of corn alternating with alfalfa. Stripcropping helps keep soil from washing down slopes.



Kreider, who signed up as a district cooperator in 1946, says he practices soil conservation "to protect my investment in my land."



Grassed waterway of reed canarygrass and tall fescue moves stormwater safely off field without taking the soil with it. The light grain on the left is a strip of wheat; a strip of alfalfa is alongside the barn and hybrid corn is growing on right.



Farm worker combines strip of wheat near Chestnut Level. Woodlands behind field, like other woods in area, have been left virtually untouched since the first aerial photo was taken in 1937.

This fall the Soil Conservation Service mailed 600 newspaper and magazine photo editors this pictorial record of what has happened to 2,400 rolling acres of Pennsylvania farmland during the last 40 years.

Photos, Donald C. Schuhart.

Palouse farmers are turning to best management practices to control soil erosion and improve water quality.

by Verle G. Kaiser
and Robert F. Tegner

Clean Water: A Palouse Priority

Sediment from upstream Palouse farmland forms bars at the mouth of the Palouse River. The islands are grazed by cattle.



The Palouse is an area of tremendous grain production, great beauty, and massive, widespread erosion.

The Palouse is a distinct area in southeastern Washington, reaching into Idaho and Oregon. Through much of this land winds the river called Palouse. It flows from the highest peaks of the Coeur d'Alene Mountains of northern Idaho through steep, forested hills. Then it breaks out into the rolling terrain typical of Palouse country. Downstream, it becomes trapped in a deep canyon and plunges over a 200-foot precipice called Palouse Falls, and eventually it empties into the Snake River, which discharges into the Columbia.

From its source to its mouth, the Palouse River travels about 150 miles, draining 2 million acres in eight counties in Idaho and Washington. Nearly 60 percent of the Palouse basin is

cropland. The extremely deep loess soils are among the most productive in the world for growing wheat, barley, peas, lentils, and other field crops. In fact, wheat yields often top 100 bushels per acre—without irrigation.

Palouse scenery, characteristics, and problems are products of what has happened there over the years. In ancient times, there were basaltic flows, deep deposits of windblown soils, and lengthy periods of undisturbed grass cover that produced a maximum build-up of organic matter and fertility.

Before the early 1800's, the Palouse was Indian land. Although Indians didn't live there, they came to gather food and graze their large herds of horses. For the most part, they left the land in its natural condition.

Settlement by pioneers began in the 1860's. At first they raised cattle and hogs, but it wasn't long before they

discovered that the fertile, virgin land produced excellent yields of grain.

Soon, grass cover was stripped from the steep, erodible slopes. Soil was pulverized and made even more erodible by plowing. Natural waterways were plowed out. Summer fallowing in the higher rainfall areas saturated the soil and increased runoff. The hills were cultivated up and down instead of on the contour, and no stubble or mulch was left to protect the soil.

The result was erosion at a rate not exceeded anywhere in the Nation: An annual loss of 20 million tons of soil from more than 1 million acres of cropland was not uncommon.

In 1930, the Palouse Erosion Experiment Station was set up north of Pullman, Wash., and later in the decade, the Civilian Conservation Corps and the Soil Conservation Service helped farmers repair erosion damage



Seedbed is prepared for planting winter wheat. The Palouse is an area of tremendous grain production. Wheat yields in the Palouse basin often top 100 bushels an acre.



and install preventive measures. In 1940, the first soil conservation district in the State, the North Palouse, was established.

Cost sharing for conservation measures was started, but war, surpluses, allotments, economics, and politics have thwarted significant progress toward solving the Palouse erosion problems.

Now, because of the Federal Water Pollution Control Act Amendments of 1972, erosion must be halted to keep runaway soil out of streams, rivers, and reservoirs.

One vivid example of sediment damage caused by Palouse erosion is evident where the Lower Monumental Dam on the Snake River backs water up to the mouth of the Palouse River.

The reservoir first filled with water in 1969. By 1970, huge sediment bars appeared in the reservoir, formed by

the millions of tons of topsoil stripped from Palouse farmland. By 1973, even the upper part of the mouth of the Palouse River began filling with sediment. Today, the sediment bars have evolved into islands that are used for grazing cattle, and sediment continues to pour into the reservoir.

Because of the antipollution law, however, new forces are working to control erosion. SCS, the Forest Service, and the Economic Research Service have completed a study of the Palouse River basin requested by the State Department of Ecology (DOE), which administers the law in Washington.

The State Conservation Commission is working with DOE and conservation districts to promote the best management practices for conserving soil in the dryland farming area. Through local water quality committees, dis-

tricts and farmers are determining the conservation practices best suited to specific areas. SCS and the Washington State University Cooperative Extension Service have assigned employees to work with the committees and are cooperating with DOE and the commission in an information program supporting the committees.

There is urgency in the effort. The law calls for completion of water quality planning by 1978 and for fishable, swimmable waters by 1983.

Both soil and time are a-wasting.

Mr. Kaiser, formerly State agronomist, SCS, Spokane, Wash., is now retired. Mr. Tegner is public information officer, SCS, Spokane, Wash.



Surface residue is weighed during an evaluation of fall field conditions before winter runoff season.



Sediment and straw washed from bare land give evidence of the erosion problem in the Palouse basin.



In sharp contrast to the deep, fertile soil of the Palouse is the channelled scabland which borders the Palouse in the North.

Erosion along Lake Superior after a spring thaw contributes to the pollution problem.



Improved Water Quality for Lake Superior

by David A. Zarkin

Streams that feed southwestern Lake Superior may never run blue—but the Red Clay Project is aimed at helping lessen water-quality problems.

Red rivers churn through the countryside along the southwestern tip of Lake Superior. These waters eventually spill into the lake—the world's largest body of fresh water—making huge fanlike patterns of red at the points of entry.

The red is produced by erosion from the area's native red-clay soil, left behind by Lake Superior eons ago as its waters receded. The soil is agriculturally productive but highly erodible. It is a shrink-swell soil that fractures easily when disturbed and then moves into streams and rivers. Once in the water, it remains suspended for long periods.

The U.S. Environmental Protection Agency is funding three research and demonstration projects under Section 108 of Public Law 92-500. The projects are designed to come up with new methods and techniques for eliminating or controlling pollution in watersheds of the Great Lakes.

The Red Clay Project is one of the projects aimed at reducing soil erosion to keep hard-to-manage soil out of Lake Superior. The project covers five counties in Minnesota and Wisconsin. The prime contractor for the project is the Douglas County Soil and Water



Conservation District in Wisconsin. Four other conservation districts are involved, along with many cooperating agencies and institutions.

Total erosion control may be neither feasible nor achievable. "We'll never make the streams run blue," said Project Director Steve Andrews. "That's out of the question." Instead, the project will try to show that economically practical methods can be developed for improving water quality. Data that become available through the project should be helpful later in planning and implementing pollution control efforts.

Working through their local soil and water conservation districts, public and private landowners participating in the project develop conservation plans with assistance from the Soil Conservation Service. County Extension agents are also available to help. Cost-sharing assistance is provided to help landowners install planned practices.

Response has been positive, particularly among farmers. Agricultural runoff—from unchecked livestock grazing, for example—is a major pollutant. Cattle travel up and down stream-

banks, disturbing the soil and making paths in the ravines. Fencing paid for by the project is keeping cattle on the upland, thus preventing some erosion of the creek banks. Other land management practices—such as pasture seeding, new pasture development, and installation of diversion ditches—are holding soil in place.

Farmers John Lunda and Robert Meliska, of Bayfield County, Wis., are among those getting help through the project in installing measures to keep cattle in pastures rather than along creek banks. "I wanted to do these things on my land anyway," said Lunda. "I wish all farmers in the area would join up," Meliska agreed, mentioning the cost-sharing aspects of the project as a major advantage. "I couldn't do it on my own," he added, "because of the high cost."

Roadbank erosion also contributes heavily to the sediment load. Project officials use shaping, seeding, and other conservation practices to prevent soil from washing away. Studies will show land where heavy soil losses can be expected, so highway engineers can avoid these areas in planning for road construction.



A roadside seeding demonstration is conducted as part of the Red Clay Project. A grass-legume seed mixture is applied with a wood-fiber mulch by a hydroseeder. The seedbed is located at a badly eroded site on the red clay soils in Douglas County, Wis.

A well is installed on Mel Paetznick's farm in Minnesota as part of the farmer's overall conservation plan. Paetznick has a long-term agreement with the Red Clay Project and the Carlton County Soil and Water Conservation District.

Since the Red Clay Project is a research and demonstration effort rather than an "action" program, it is still early for definitive results. Farmer Lunda, for example, has signed a long-term contract with the Bayfield County Soil and Water Conservation District through the project and will evaluate the effectiveness of his conservation work when his contract expires.

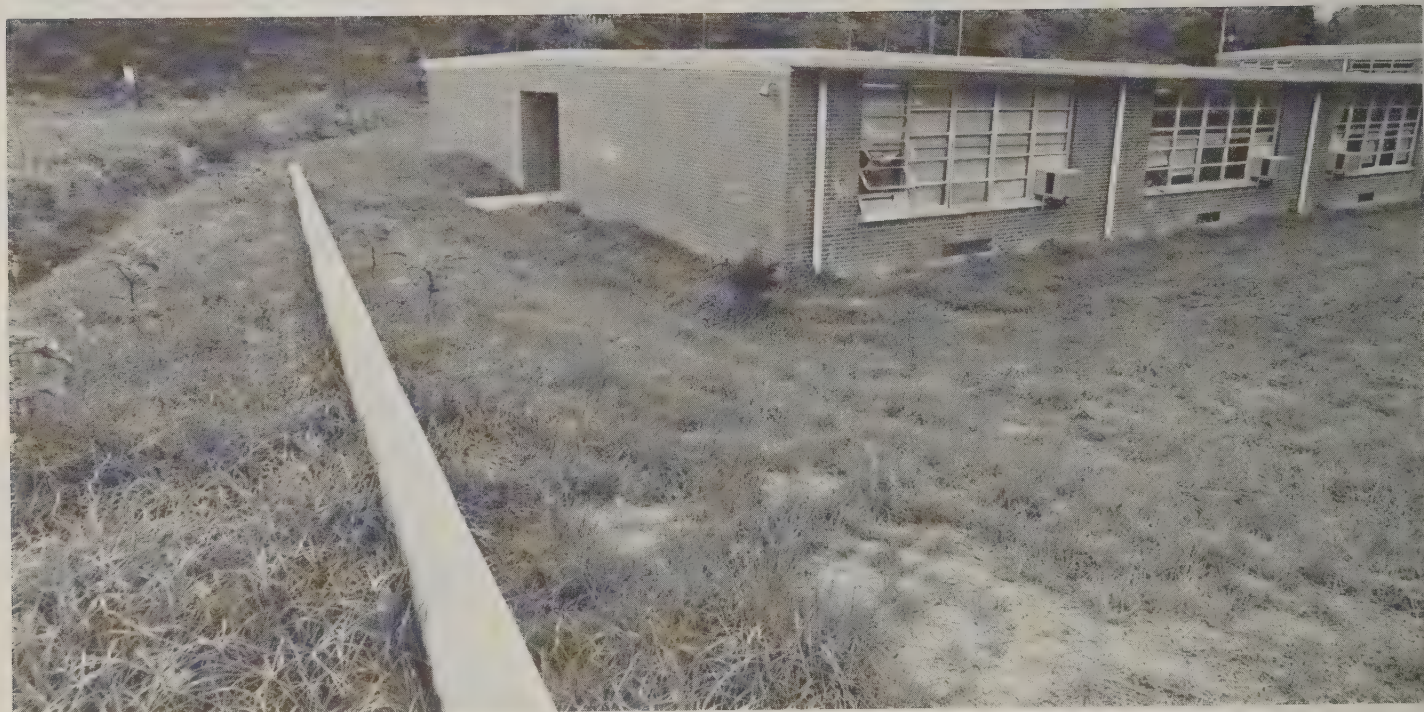
Preliminary data are coming in, however. Project workers are monitoring water quality to determine the impact of conservation management practices on agricultural lands. Another project survey is measuring the impact of stabilization efforts on roadsides and streambanks.

The project's success will be determined ultimately by the willingness of farmers and other landowners in the project area's soil and water conservation districts to develop and implement conservation plans on their land.

Mr. Zarkin is extension information specialist, Agricultural Extension Service, St. Paul, Minn.

Dry Classrooms for Wet Valleys

by William H. Dempsey



At Salyer Elementary School a 2½-foot high, reinforced concrete floodwall was installed as part of the RC&D measure.

Runoff from eastern Kentucky's steep hills regularly flooded some schools in the Big Sandy RC&D Area. Conservation assistance and planning now have made classrooms safer—and drier—places in which to study.

"It's almost a choice between locating on a flood plain and tearing down a mountain every time we build something," said Ollie J. Arnett, chairman of the Big Sandy Resource Conservation and Development (RC&D) Area Council.

His subject is rugged eastern Kentucky. "These narrow valleys, steep hills, and sharp ridgetops severely limit residential, commercial, industrial, and transportation developments," Arnett explained.

He could have added "school developments" to his list.

For years, several of the older school buildings in the Big Sandy area have been hit with periodic floods. They are located in narrow valleys, directly in the path of water running off

the surrounding mountains. After a heavy rain, schoolhouse floors may have water a few inches to over a foot deep.

Volume of water isn't the problem. "A flood is a flood," said James Newman, Chairman of the RC&D Community Facilities Committee, "whether it's an inch of muddy water in a school or a valley full of water." The problem is two-fold: How to protect existing schools from floodwaters and how to plan future school construction to minimize flooding hazards.

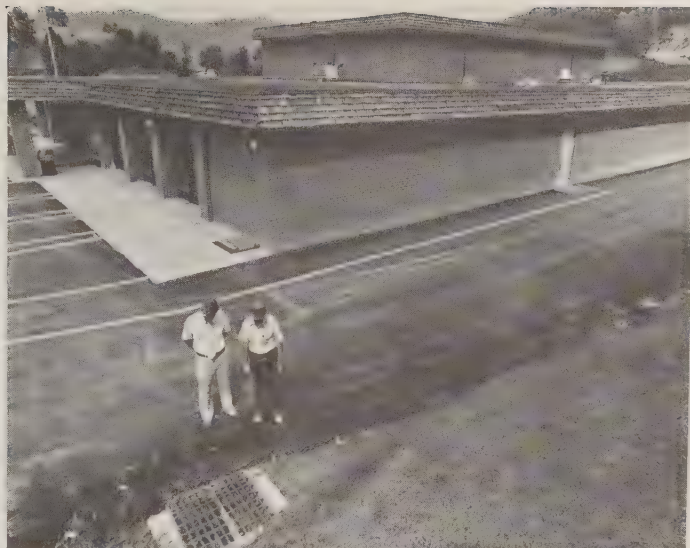
The Big Sandy RC&D Area has found some of the answers.

Johnson County's Porter Elementary School was a classic example of the consequences of building on a flood plain. Runoff from the hills behind the

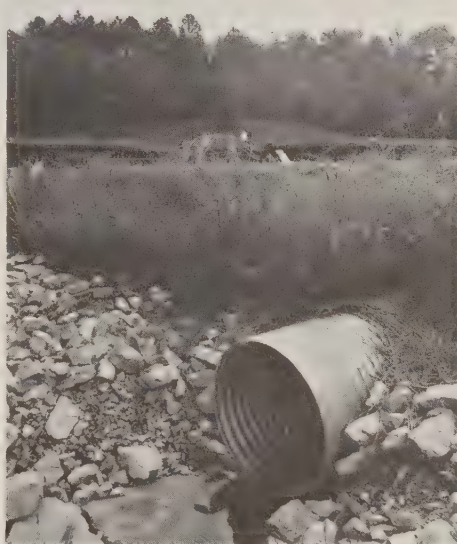
building sometimes overflowed the drainageway and flooded the school cafeteria. The County School Board turned to the Johnson County Conservation District for help. At least six other schools in the Big Sandy area, the board pointed out, had similar flooding problems.

District supervisors recognized the hazards. They joined school board officials in asking the Big Sandy RC&D Council for assistance, through the Soil Conservation Service, in solving Porter's flooding problems.

SCS engineers helped plan and design the RC&D flood control measure which included a sodded interception ditch, grated drop inlets, and a large, reinforced concrete conduit to carry water underground across the



Flood control measures at Porter Elementary include grated drop inlets (above) and a conduit which carries water across the schoolyard to a protected outlet (right). Top right, Jimmy Marcum (right), school principal, and Larry Delong, SCS district conservationist, inspect completed inlet.



school yard to a protected outlet in a stream channel.

In spring 1977, construction of the measure was about 90 percent complete when heavy rains caused widespread flood damage in the valley. However, the RC&D measure carried the floodwater away and the school reported only minor damages.

While assessing the effects of the heavy rainfall, School Official Leon Burchett said, "Without the flood prevention measure we would be shoveling mud and mopping up water in the cafeteria today—but it's dry."

Another school with a flooding problem—Salyer Elementary in Magoffin County—received similar help. At Salyer, construction has been completed on a floodway through what was

a parking lot. A reinforced concrete floodwall about 2½ feet high was installed in front of the school building and a drainage conduit was installed between the floodwall and school building to remove water that would have collected there.

Field surveys are in progress at two other schools, and flood-proofing plans are going to be explored for three schools that have less severe problems.

Former Floyd County Superintendent of Schools Charles Clark feels that future flooding difficulties can be avoided by thorough, long-range site planning. He points to multimillion-dollar projects like Allen Central High in Floyd County and Johnson Central High in Johnson County as evidence

that schools can be constructed in nonflood areas.

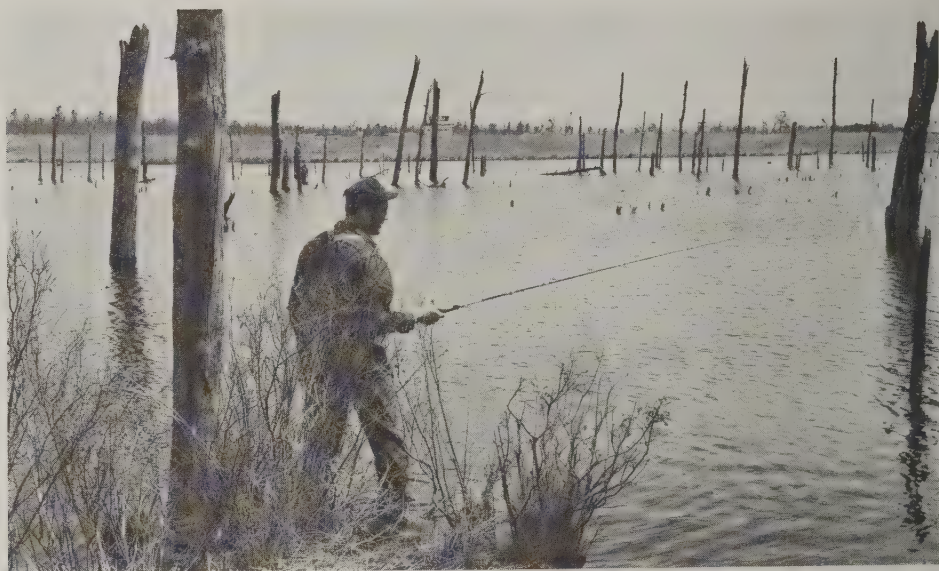
These projects were successful, Clark believes, because local decisionmakers received site selection assistance from SCS, the conservation districts, and the Big Sandy RC&D Area Council. The data provided and used in selecting sites included soil limitations or potentials and likely flooding hazards.

"We could have avoided some earlier construction mistakes," Clark added, "if we had requested this kind of service."

Mr. Dempsey is RC&D coordinator, SCS, Prestonsburg, Ky.

Before conservation, part of the Lakehurst Naval Air Station was useless wasteland. Now it's a prize winner: for hunting, fishing, woodland, and wildlife.

Salvage Operation on Navy Wasteland



"A few years ago, the Navy considered 1,000 acres of its 7,412-acre Lakehurst Naval Air Station as useless wasteland," recalls Albert E. Newby, the station soil conservationist. Fire was a constant threat in this unused New Jersey pine barrens covered with pitch pines, scrub oaks, bogs, and swamp.

Now, conservation has converted the wasteland into a prize-winning woodland and wildlife area. "We have received several awards for this achievement," said Newby, "including the top Goodyear Conservation Award for the New Jersey-Delaware area."

After World War II, military and civilian station personnel formed a conservation club. Using their own money and working during their off-duty hours, club members began cutting new access roads and fire lanes. They also built dams on a small stream, creating new fishing sites in a series of three small lakes.

State and Federal fish and wildlife biologists helped with technical planning advice, experimental plantings, and pond stocking. The Soil Conservation Service tested new plant materials on eroding slopes and droughty soils. Gradually, fish and wildlife populations improved.

Newby, a former district conservationist with SCS, joined the station in

1963 as its first forester. Working with the SCS office in nearby Toms River, he drafted a conservation plan for the entire base. The plan included stabilizing bare, wind-blown areas and improving small ponds, managing wildlife food and cover plants, controlling erosion, and managing woodland. It also provided for a general upgrading of landscaping in the built-up sections of the base.

As one of the first steps in the plan, Lakehurst became a member of the local Ocean County Soil Conservation District. The district bolstered conservation efforts on the base by arranging for technical assistance from Federal and State resource agencies.

Fire control was top priority. "Without it," said Newby, "our plans for a wildlife conservation area would have been completely useless."

Five miles of gravel-based access roads were constructed and more fire lanes added. A 125-foot-wide fire lane along the entire outer boundary of the station was installed to block any fires from outside. Twenty-two small fire ponds were placed at strategic water source points along the new access roads.

Then, Newby began the process of removing fire-damaged trees. Those with pulpwood value were harvested annually by local bidders. Those that

remained were destroyed by prescribed burning or were ground up and pushed into small piles for wildlife cover.

Next, the cleared areas were either seeded for a new stand of pine trees or seeded and managed as a wildlife food plot. Newby found that pitch pine makes the most successful stands at an average cost of \$35 per acre. More than 400 acres have been seeded successfully during the past 3 years.

The new wildlife food plots, established in some of the cleared areas, are popular with hunters. "We have about 130 acres of these plots now," said Newby. Usually, they are 200 to 400 yards long and up to 150 feet wide.

SCS plant scientists have identified a number of food and cover-producing plants that can be established in this sandy soil. Most of these plants were tested at the SCS Cape May Courthouse Plant Materials Center in New Jersey, or on a 20-acre site at Lakehurst. Among the successful entries are sericea lespedeza, flatpea, deertongue, reed canarygrass, switchgrass, weeping lovegrass, and Kentucky 31 tall fescue. Shrubs planted along the borders of the food plots include autumn olive, shrub lespedeza, and bristly locust. The shrubs and grasses provide food and cover for

Below, Al Newby, soil conservationist at Lakehurst, found that pitch pine makes the most successful stands. Below left, members of the station's Conservation Club, as well as local people, find good fishing in the manmade ponds.



deer, pheasant, quail, and rabbits.

Under a new policy, the station issues \$10 permits to anyone who wishes to come in and cut a cord of wood along the edge of the plot. The area cut may extend up to 50 feet back from the plot, thus providing the ideal cut-back borders recommended by wildlife experts. The permit fee helps support wildlife improvements on the station.

From the air, Newby's new food plots resemble a golf course cut through a wooded area. A hunter can walk from one food plot to another through only a few yards of trees. The Conservation Club issues a pocket-sized map of these plots.

The club also releases about 1,000 pheasant at the start of hunting season, with State Fish and Game people releasing another 700 to 1,000. Natural populations of both deer and quail are increasing.

Fishing is also a popular pastime. Large potential catches of trout, bass, bluegills, perch, bullheads, catfish, and pickerel inhabit the lakes in the conservation area. Every year, Fish and Wildlife Service specialists of the U.S. Department of the Interior stock these lakes. The original dams built by the club still exist, but SCS designs are ready for making structural improvements whenever budgets permit.

Meetings:

December

- 4-6 American Society of Farm Managers and Rural Appraisers, Inc., Denver, Colo.
- 5-9 American Geophysical Union, San Francisco, Calif.
- 12-13 Erosion and Sedimentation Symposium, Chicago, Ill.
- 13-16 American Society of Agricultural Engineers, Chicago, Ill.

January

- 3-6 Catfish Farmers of America, Atlanta, Ga.
- 8-12 American Farm Bureau Federation, Houston, Tex.
- 8-12 National Council of Farmer Cooperatives, San Francisco, Calif.
- 9-13 North American Game Breeders and Shooting Preserve Association, San Antonio, Tex.
- 17-21 National Wool Growers Association, Inc., Denver, Colo.
- 24-26 National Cattlemen's Association, New Orleans, La.
- 31-Feb. 2 Southeastern Section of the Society of American Foresters, Birmingham, Ala.

February

- 5-9 National Association of Conservation Districts, Anaheim, Calif.
- 5-10 Society for Range Management, San Antonio, Tex.
- 17-20 American Association of School Administrators, Atlanta, Ga.
- 19-22 National Association of Manufacturers, Washington, D.C.
- 21-22 Southern Forest Institute, Inc., Atlanta, Ga.
- 26-Mar. 1 Land Improvement Contractors of America, Las Vegas, Nev.
- 26-Mar. 3 American Society of Photogrammetry, Washington, D.C.
- 28-Mar. 3 American Camping Association, Anaheim, Calif.

It costs \$2 per person to hunt or fish on the station. This fee is also directed toward wildlife conservation improvements.

"Over the past 3 years, 2,650 military and 7,000 civilian hunters and fishermen have tried their luck here," said Newby. "Other visitors—more than 12,000 of them—include Izaak Walton League members, rod and gun clubbers, Scouts, and local retriever clubs, birdwatchers, and hikers."

Lakehurst captured two first place awards and two second place awards

in the Department of Defense Natural Resources Conservation Program. Then it took the Goodyear Award. Al Newby is still wondering how to top that.

Mr. Smith is head, information staff, Northeast Technical Service Center, SCS, Broomall, Pa.

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Research Is Everybody's Business

From the Administrator

Research is essential to expand our understanding of soil, water, and crop management. But conservation research is not the exclusive province of the scientist; it also requires the involvement of farmers and ranchers and professional conservationists.

There are three important ways in which everyone can participate in research. First, we can help identify research needs . . . tell scientists what is required most urgently in the field. SCS has special committees in each State office, in the technical service centers, and in the Washington office to review suggestions for research and to recommend projects. Many of these recommendations are passed along to the Agricultural Research Service, Economic Research Service, Forest Service, and other agencies.

Second, all of us need to work harder at digging out research results and in getting them applied. Scientific journals, farm magazines, and USDA and university publications all report on soil and water research. If a report sounds promising, we should ask the sources mentioned in the article for more information.

By staying alert to usable research findings, field people also can reduce the lag between a discovery and its application. More than a century elapsed between basic discoveries about the nature of electricity and the invention of the light bulb. Development of the transistorized radio, however, lagged only 4 years behind the invention of the transistor. Lag time is getting shorter; our efforts can make it shorter still.

SCS and district people also need to take an active part in local cooperative research projects and trials. Such projects offer an excellent chance to contribute practical knowledge about conservation and to learn from other disciplines.

Third, we need to remember that not all important discoveries and inventions are made by research scientists. In Vietnam, for example, there is a fall festival honoring a peasant woman named Ba Heng who discovered 300 years ago that her rice grew better if she planted the floating water fern *Azolla* in the paddies. Today, scientists understand that *Azolla* and blue-green algae work symbiotically to "fix" nitrogen so that other plants can use it. Farmers continue to make valuable observations and come up with ingenious inventions.

These three activities—communicating needs to scientists, helping apply research findings promptly, and staying alert to new discoveries at home—are effective ways for district leaders and SCS field people to participate in conservation research.

Mel Davis

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Bob Bergland
Secretary of Agriculture

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Soil Conservation Service

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Cover:

Iowa farmers, who produce about one-fifth of the U.S. corn crop, are becoming more and more interested in soil and water conservation. (See pages 7 through 11.)

Soil Conservation

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Researchers at the USDA Sedimentation Laboratory have come up with some surprising results in their studies on erosion and water pollution.

Research for Resources

L. D. Meyer, leader of the Erosion Research Unit, adjusts controls of the rain simulator for an indoor experiment.

Charter of the USDA Sedimentation Laboratory

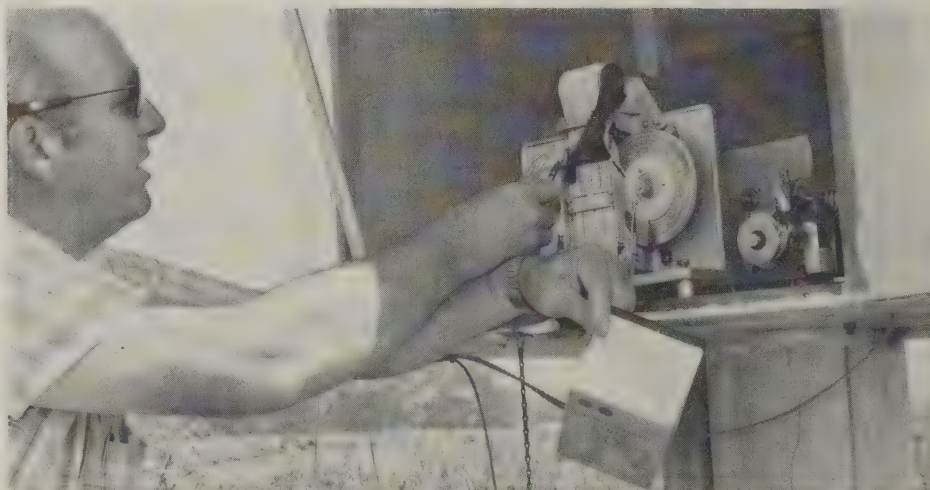
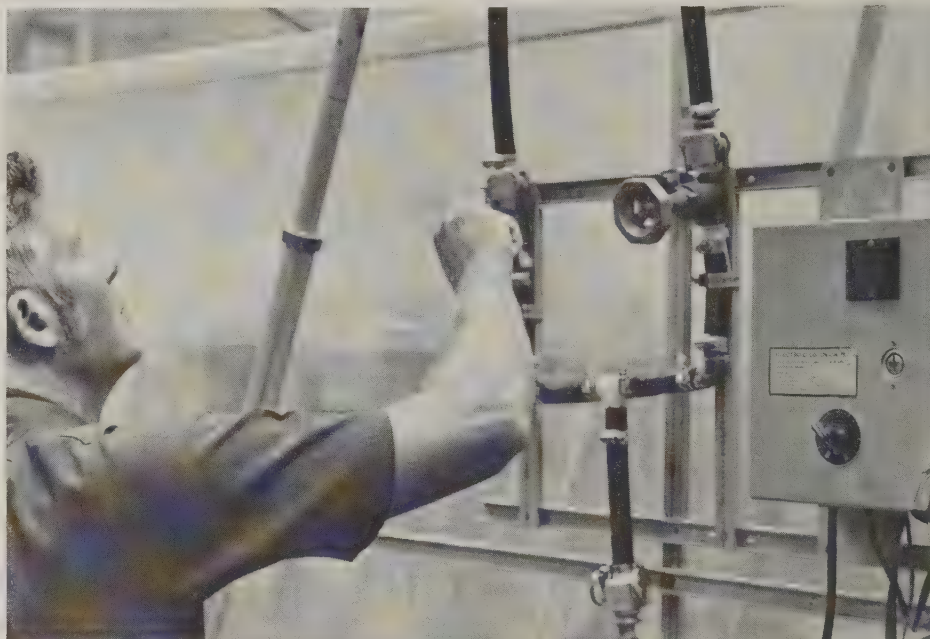
The USDA Sedimentation Laboratory seeks solutions to erosion and sedimentation problems of our country with emphasis on those associated with the agricultural use of lands.

These problems involve the mechanics of soil erosion; sediment transport capacity; sediment deposition in stream channels, on flood plains, and in reservoirs; stream channel stability; the chemical, physical, and biological characteristics of the complex of water and sediments on streams and impoundments; and hydrology.

Of major importance is the concept of sediment as a pollutant and as a carrier of pollutants including agricultural chemicals.

The mission is to seek, through research, better methods, practices, and techniques for evaluating and controlling sediment and the effects of sediment on environmental quality.

Equipment automatically records depth of flow and duration, and takes samples of sediment-laden water. Agricultural Engineer Carl Murphree examines equipment at a recording station.



Below left, Engineering Technician Jack D. Greer checks equipment that records runoff and soil loss from an experimental plot of clean-cultivated corn. The device automatically takes samples and stores them for later analysis. Below right, surface runoff transports sediment to the ends of rows. Sediment is eventually deposited in ditches and streams.



An indoor experiment is conducted with a rain simulator. The muddy runoff water is collected in the bucket for later analysis.

Coming up with new information that runs counter to "commonsense" beliefs about soil and water is practically an everyday occurrence at the U.S. Department of Agriculture's Sedimentation Laboratory.

Among other things, Agricultural Research Service (ARS) scientists at the Oxford, Miss., lab have discovered the following:

- Much of our Class I, level cropland, once considered to suffer very little erosion, actually loses topsoil at an alarming rate.
- Visible rill or gully erosion may be a less serious polluter of water than "invisible" soil erosion.
- Cool, clear water may be a contradiction in terms. Other things being equal, muddy water stays cooler than clear water.
- A side effect of atmospheric nuclear bomb tests is being used to study erosion and sedimentation.

The laboratory's director, Donn G. DeCoursey, reported that "contrary to what we formerly believed, the soil loss from much of our Class I, clean-cultivated land may be above tolerable limits."

Studies on the Mississippi Delta for 4 years revealed that soil losses may average more than 7 tons per acre per

year, with 13 tons the highest annual loss reported.

DeCoursey's staff is following up with intensive research to find out which soil properties affect erosion on level or near-level land.

In seeking answers to problems, the Mississippi researchers work closely with personnel of the Soil Conservation Service, Forest Service, Corps of Engineers, State experiment stations, and other ARS facilities.

Research into so-called invisible erosion is a project of L. D. Meyer, head of the lab's Erosion Research Unit.

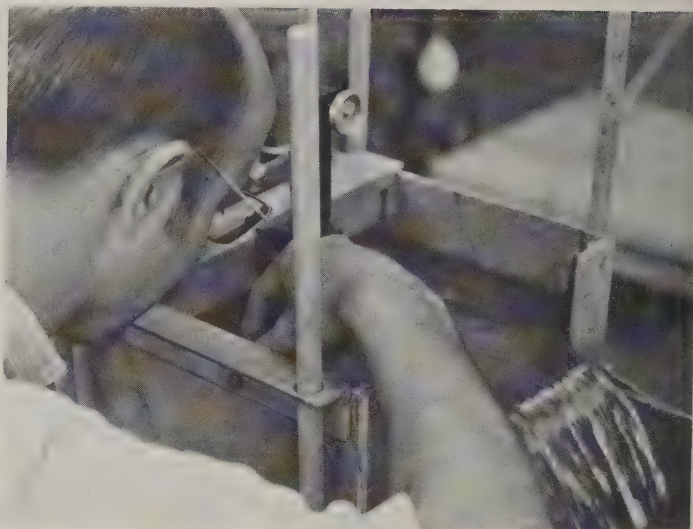
"The right name for it is *interrill* erosion," Meyer explained.

Interrill erosion, according to the scientist, is different from sheet erosion. Sheet erosion can include rills or miniature gullies which can be "rubbed out" each year by tillage equipment.

"Interrill erosion takes place on the surface, literally between rills," Meyer explained. "Visible rills and gullies get larger as they proceed down a slope, but inconspicuous interrill erosion is uniformly damaging all over the slope." Interrill erosion is caused chiefly by the impact of raindrops.

Meyer and his staff suspect that interrill erosion is an important cause of soil loss on near-level land. They are also concerned because chemicals that have settled on the surface may be carried into waterways along with

Below left, Calvin K. Mutchler (left), ARS researcher, and Jack D. Greer, engineering technician, discuss the quality of a test plot of minimum-tillage corn at the North Mississippi Branch Experiment Station at Holly Springs. Below right, J. B. Murphey, geologist, works with experimental flume which is carried to field locations to test erodibility of soil.



the soil material from interrill erosion. Oxford researchers can already cite strong evidence that farm chemical yields in runoff water are closely associated with sediment yields.

A 1975 study showed that 93 percent of the yields of toxaphene, a pesticide, were associated with the sediments in runoff, according to L. L. McDowell, research leader. Only 7 percent of the yields, he found, were transported in solution.

Conclusion: erosion control practices are vital during the tillage period not only to reduce loss of topsoil but also to reduce the pollution of surface waters by sediments and farm chemicals.

The lab is just as concerned with when erosion occurs as how. In the Mississippi Delta, the storms that cause the worst erosion and sedimentation usually occur during late winter and spring, when soil moisture is high.

Research leader Cal Mutchler calls this "a fact of genuine significance." His investigation unit found that on the erodible upland brown loam soils of North Mississippi, about 70 percent of erosion from conventionally cultivated corn occurs during April, May, and June. A field with a slope of 5 percent will lose between 9 and 13 tons per acre per year, most of it during the spring.

But Mutchler found that no-till practices, which provide cover during the

spring, result in losses of only 0.3 tons per acre.

"You can see the tremendous potential for reducing erosion by applying conservation tillage practices during this relatively short period every year," the researcher pointed out.

Research into sediment is focused on small particles. Scientists have found that large aggregates, sand, and gravel are predictable; when the velocity of sediment-laden water slows, large particles drop out.

But colloidal material, less than .002 mm in size, can stay in solution from 6 months to 2 years.

"In other words," according to Director DeCoursey, "a lake in an area of fine colloids may stay muddy all the time. But there's so much we don't know. How much of the sediment finally settles out in the lake? How much passes downstream with spillway overflow? How much pollution is linked to the small soil particles? We need research to find the answers."

And what about muddy water staying cooler than clear water? Frank R. Schiebe, a hydraulic engineer, admitted that "the idea runs counter to the old cowboy song."

But Schiebe and his associates found that a clear lake is penetrated by the sunlight and stores energy. On the other hand, sunlight does not penetrate the surface of a muddy lake. It is reflected, and the water stays cooler.

The engineers speculate that the difference in the water temperature of a clear lake and a muddy lake could be used to make a kind of heat pump powered by solar energy.

It is difficult to believe that any good has come from radioactive fallout, but one result of nuclear bomb tests is being used at the Oxford lab to help measure sediment accumulations.

Each atmospheric bomb test, according to researcher J. R. McHenry, inadvertently tagged soil with Cesium-137, a radioactive tracer. Since Cesium-137 fallout is attached to small soil particles, layers of the isotope in core samples from lake beds give scientists a fairly accurate estimate of sedimentation rates. It is also possible to trace sources of the sediment in the watershed.

Changes in agriculture keep the Sedimentation Laboratory busy. According to Director DeCoursey, new tillage equipment, new chemicals, new crops, and economic changes force researchers to search for new answers to problems of erosion, transport, and deposition of sediment.

Mr. Crowley is head, information staff, South Technical Service Center, SCS, Fort Worth, Tex.



Iowa, with its high-producing farmland, has a big need for soil and water conservation measures.

by William J. Brune

Conservation Where the Tall Corn Grows

Iowa produces about one-fifth of the Nation's corn crop, more than one-fifth of the pork supply, and one-seventh of the grain-fed beef.

On the Marlowe Feldman farm, corn is planted in an estimated 1,000 pounds per acre of soybean residue.



About half of Iowa is prime farmland, and an increasing acreage of this good, flat land has been planted in soybeans in recent years. Wind erosion is a problem on such fields, particularly in north-central Iowa.

You won't find major professional sports teams in Iowa. Or surfing. Or subways.

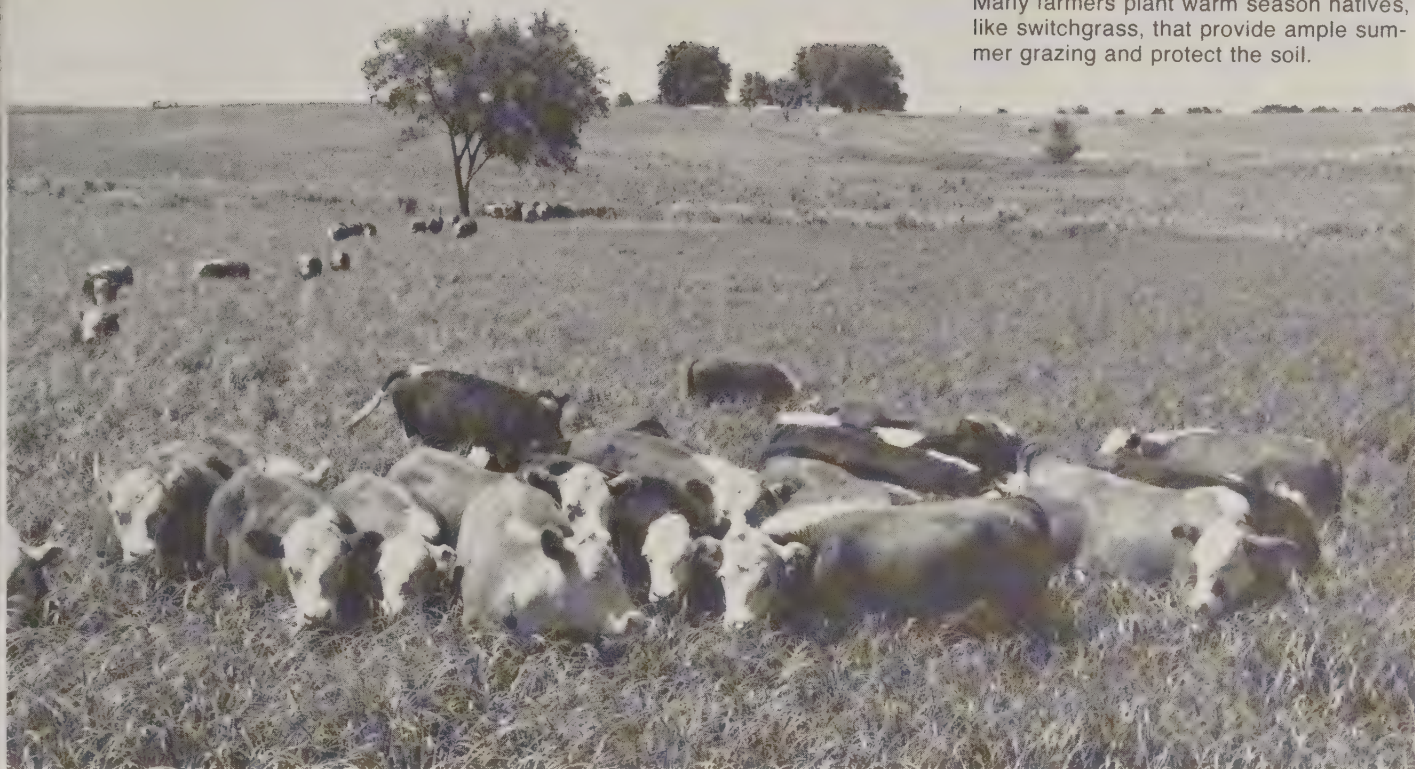
What you will find is high-producing farmland, and a lot of it. It's the State's most valuable natural resource, and everyone from the Governor on down will tell you so.

Iowa's first governor, Ansel Briggs, who settled in our Maquoketa Valley in the 1830's, ran for office on the slogan: "No banks but soil banks, and they well tilled."

Iowa is landlocked; we're about as far from an ocean (1,200 miles) as any State in the Union. Our "Little Switzerland" hills in the northeast corner of the State are beautiful, but they are unlikely to inspire a songwriter to compose "Iowa Mountain High." We don't have 10,000 natural lakes, like one of our neighbors. Most of *our* lakes are manmade, to provide water for drinking, for livestock and irrigation, and for fire protection and recreation.

What we do have is a reputation as the place "where the tall corn grows." We produce about one-fifth of the Nation's corn crop. We also produce

Much of the rolling land in southern Iowa is better suited to pasture than row crops. Many farmers plant warm season natives, like switchgrass, that provide ample summer grazing and protect the soil.



more than one-fifth of the pork supply and one-seventh of the grain-fed beef. In all, with 95 percent of "the beautiful land" in agricultural use, Iowa produces 10 percent of America's food supply.

Our population is relatively small. Bordered on the east by the Mississippi River and on the west by the Missouri, Iowa's 36 million acres are home for fewer than 3 million people. That's half the population of Massachusetts, for example, in an area seven times as large. We still have room to stretch and breathe in Iowa.

While we're basically rural, we also have important industries. Iowa is either home base or boasts the largest factory for John Deere, Maytag, Amana, Quaker Oats, Lennox, Massey-Ferguson, and Winnebago, to name but a few. Most of our industries either process farm products or sell to farmers.

With this farm orientation, people here believe that agriculture and soil and water management are pretty important. The town businessman is just as interested as the farmer in the

Iowa is well suited to growing corn and soybeans, but the soil needs to be protected with carefully planned conservation systems.

weather, prices, and yields. One-third of all Iowa workers, in fact, depend directly on agriculture for their jobs, and another 50 percent depend on it indirectly.

Weather is the most popular topic of conversation, and we have all kinds. Take 1977, for example. After the worst drought in central Iowa in 40 years early last summer, we had the wettest August on record around Des Moines.

Our close ties to the land may explain why Iowa was one of the first States with an erosion control law and the first State to appropriate cost-share funds for soil conservation practices. Iowa has made about \$4 million available to landowners in each of the past 2 years. That's in addition to Federal funds. (But we could always use more.)

The funds are put to good use to

protect our soil and water. Of Iowa's 36 million acres, 26 million are cropland, with more than 20 million acres in row crops. Some of that land is flat, but much is gently rolling, formed by the action of glaciers in four ice ages.

The soils of Iowa vary widely. Along both of the great rivers that border the State, soils form "sugar clay" loess hills; along the Missouri some are more than 100 feet deep. In north-central Iowa, which is relatively flat, the fertile prairie soils form the State's best corn country. In both northern corners, there are steep hills, and a large part of the land is in grass. In the south, bordering Missouri, soils were formed under grass and forests and are not as productive. Most are on slopes and are subject to severe erosion.

Iowa is well suited to growing corn and soybeans, but the soil needs to be

Today, Iowa's farmers are showing increasing interest in two conservation practices—conservation tillage and parallel terraces.



Vernon "Slewfoot" Hoffman is a conservation-minded farmer who has just built more than 1 mile of additional terraces on his big Iowa farm.



Our close ties with the land may explain why Iowa was one of the first States with an erosion control law.

protected with carefully planned conservation systems. Progress in fighting erosion has been steady, but much remains to be done. The Soil Conservation Service estimates that about 40 percent of Iowa's soils are adequately protected against erosion from water and wind. Coordinated private, local, State, and Federal efforts will be needed to finish the job.

Iowa needs more farmers with the positive attitude of Vernon "Slewfoot" Hoffman, a Buchanan County producer, who is undaunted by the cost of soil and water conservation measures on his \$2,000 to \$3,000 an acre farmland.

"I looked at my crops the other day and then told the bankers they'd better get their land tilled if they want a better crop next year," said Hoffman. He had just completed 6,000 feet of terraces on his sloping cropland, commenting: "I don't know exactly how these ter-

rases work, but I do know that I can't afford to let this high-priced soil wash away."

Technical help for farmers like Slewfoot Hoffman is provided through 100 soil conservation districts—one in each of our 99 counties and two in Pottawattamie County. SCS has a field office in each, typically with a district conservationist and a technician. The State Department of Soil Conservation hires a clerk for each office, as well as a conservation aide in some. We really work as a team here in Iowa!

The three or four people in each office serve an average of 1,300 landowners, as well as other members of the public. So far, about half the farmers have conservation plans; the other half don't. But the number with plans and adequate measures installed is growing year by year. We'd like the number to grow faster!

The fact that we have so much crop-

land in Iowa—more than 18 other States combined—accounts for our big need for soil and water conservation measures. We estimate that the average annual soil loss for sloping cropland in the State is 13 tons per acre. That's more than twice what it ought to be. During the heavy spring rains of 1974—a truly disastrous season—soil losses of 40 to 50 tons per acre were not uncommon. (Those rains, by the way, were followed by an unprecedented season of terrace-building. It's unfortunate that it takes such a hard lesson to teach some people the value of conservation.)

Today, Iowa's farmers are showing increasing interest in two conservation practices—conservation tillage, including no-till, and parallel terraces with tile drainage. More than 7 million acres of row crops are now grown under some kind of reduced tillage, although we're still arguing for more residue on some soil surfaces. About 2,000 miles of terraces were built in 1976, bringing Iowa's total to 60,000. But many more miles are needed before our soils receive adequate protection.

Agriculture is what Iowa is all about. At last count, there were about 131,000 farms in the State, encompassing more than 34 million acres.



The installation of tile drains in conjunction with terraces was promoted in the early sixties by an SCS engineer in Iowa. It was his answer to the problem of too much water trapped in terrace channels after heavy rains, particularly in poorly drained soils. What that engineer fought to have accepted a few years ago has since been widely adopted throughout the Service.

The increase in soybean acreage is putting new demands on conservationists. SCS and the soil conservation districts have helped Iowa farmers protect about 5 million acres in the past 16 years. In the same period, however, soybean acreage also increased by 5 million acres, replacing small grains, grass, or rotation crops. This change means we have to take another look at these 5 million "new" cropland acres to see if additional protective measures are needed.

But while we worry a lot about present and future needs, we are proud of past conservation accomplishments. We have 96 small watershed projects, with about one-fourth of them completed. Also in Iowa is the highly suc-

One-third of all Iowa workers depend directly on agriculture for their jobs, and another 50 percent depend on it indirectly.

cessful Little Sioux River Watershed Project, one of the 11 flood control projects authorized in 1944. More than 460 ponds and lakes and 6,200 miles of terraces are located in that project area alone.

Soils have been mapped in half the State's counties, and we're trying hard to complete four more counties a year in the cooperative soil survey program. Our goal is to have all Iowa mapped by 1986.

Four resource conservation and development areas are authorized and are experiencing success in solving local problems. Two other areas are organized and waiting.

In a nutshell, that's the story of conservation in Iowa. We've done a lot of work, but we still have much to do. We have confidence in the commonsense of Iowa farmers when it comes to taking good care of their valuable farmland. We believe that more of them

each year are going to get behind soil and water conservation.

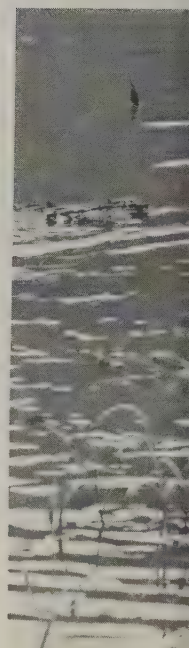
The people of Iowa also are optimistic. Where else would you find promoters holding "the world's largest hog race?" Where else would you find a young man selling T-shirts and posters inviting visitors to "Ski Iowa," showing nothing but a snow-covered haystack? SCS and the district commissioners try to share that optimism and look upon the job ahead, not as a trial, but as a challenge.

Mr. Brune is State conservationist, SCS, Des Moines, Iowa.

Sediment Ponds Turn into Freshwater Marshes

by C. Winstead Burdette
and Katherine C. Gugulis

When nature transformed temporary sediment basins into marshes which attracted wildlife, local residents' complaints about the structures turned into a movement to retain them.



No one in Columbia, Md., imagined that residents would one day circulate petitions aimed at saving six sediment basins once considered neighborhood irritants. But neither had townspeople counted on nature's transformation of the manmade ponds into freshwater marshes rich with wildlife.

When the sediment basins were installed behind new houses about 6 years ago, homeowners called the Howard Soil Conservation District (SCD) office to complain. "The first few summers we were deluged with complaints about mosquitoes from those unsightly 'mudholes'," recalled SCD Manager Robert Ziehm.

"But when the development company decided to remove the ponds this summer, some of the people who protested their installation called to protest their removal," Ziehm said.

Columbia, halfway between Baltimore and Washington, D.C., is a "new town" development that has received national recognition because of

its unique planning for social and environmental needs.

Marge and Tony Lambros are two Columbia residents who have had a change of heart about the sediment basins. "They seemed pretty awful when they first went in," said Marge Lambros. "But now that they've 'matured,' we're reaping rewards from all the wildlife using the ponds."

The wildlife immigration began about 3 years ago with the arrival of a pair of mallard ducks. "Now they've been joined by green heron, egrets, wood ducks, and even a gadwall duck," she said. Other residents have seen a variety of songbirds as well as muskrats, water snakes, turtles, raccoons, opossums, and sandpipers.

"People spend millions of dollars every year on campers, equipment, and hotels so they can get back to nature and away from the pressures of urban life," said Tony Lambros. "All I have to do is sit in my own backyard to get the same thing."

The basins, designed to trap sediment contained in runoff, were installed during 1971 and 1972. They range from ½ to 1 acre and were designed to meet requirements of a 1970 State law—one of the first of its kind in the Nation—aimed at keeping sediment generated by construction out of streams. The Maryland Water Resources Administration provides leadership while county governments issue the necessary permits and enforce the program. Responsibility for approving a developer's sediment control plan is assigned to soil conservation districts, which obtain technical assistance from the Soil Conservation Service.

"The wildlife benefits from the sediment control program are certainly something we didn't envision," admitted SCD Manager Ziehm. "They've changed our whole outlook on sediment basins. We're thinking about changing specifications for this type of pond so that developers can choose to



Homeowner Marge Lambros points out a turtle sunning itself on a log to her children. The pond attracts a variety of wildlife including mallard ducks, egrets, muskrats, and sandpipers.



design and maintain them to remain permanently."

The primary reason for present plans to remove the sediment basins, explained Ziehm, is that "some may be structurally unsafe because they were designed for temporary water storage, rather than permanent ponds."

Under the State's "pond law," districts share responsibility for approving permits for small ponds. In reviewing pond plans, SCD's use standards and specifications developed by SCS. In their present state, the marshes do not meet structural safety requirements for permanent ponds.

"If we can determine that the structures are safe or could be made safe," Ziehm added, "we'd like to see them retained."

Recently, Ziehm and several SCS specialists visited the six ponds to see what repairs or modifications would have to be made. Based on SCS's recommendations, Ziehm says he is optimistic about the feasibility of up-

grading most of the ponds. Improved piping systems and emergency spillways would be necessary to assure the integrity of the dams.

Aelred Geis, U.S. Fish and Wildlife Service biologist assigned to the Patuxent Research Center, is another who feels that the ponds should remain. "An important fringe benefit of the ponds in Columbia is their wildlife value," said Geis, an expert on the effects of urbanization on wildlife. "These sediment ponds have an amazing amount of bird use."

Over the past several years, Geis has monitored the wildlife use of open space areas in Columbia. Some of his sample plots coincided with the location of three of the sediment basins.

In 1975, Geis determined that Columbia's shallow sediment ponds were more than 300 times as likely to have ducks or other aquatic birds on them than were the deep water ponds he observed. The next year, after partial draining of one of the larger sedi-

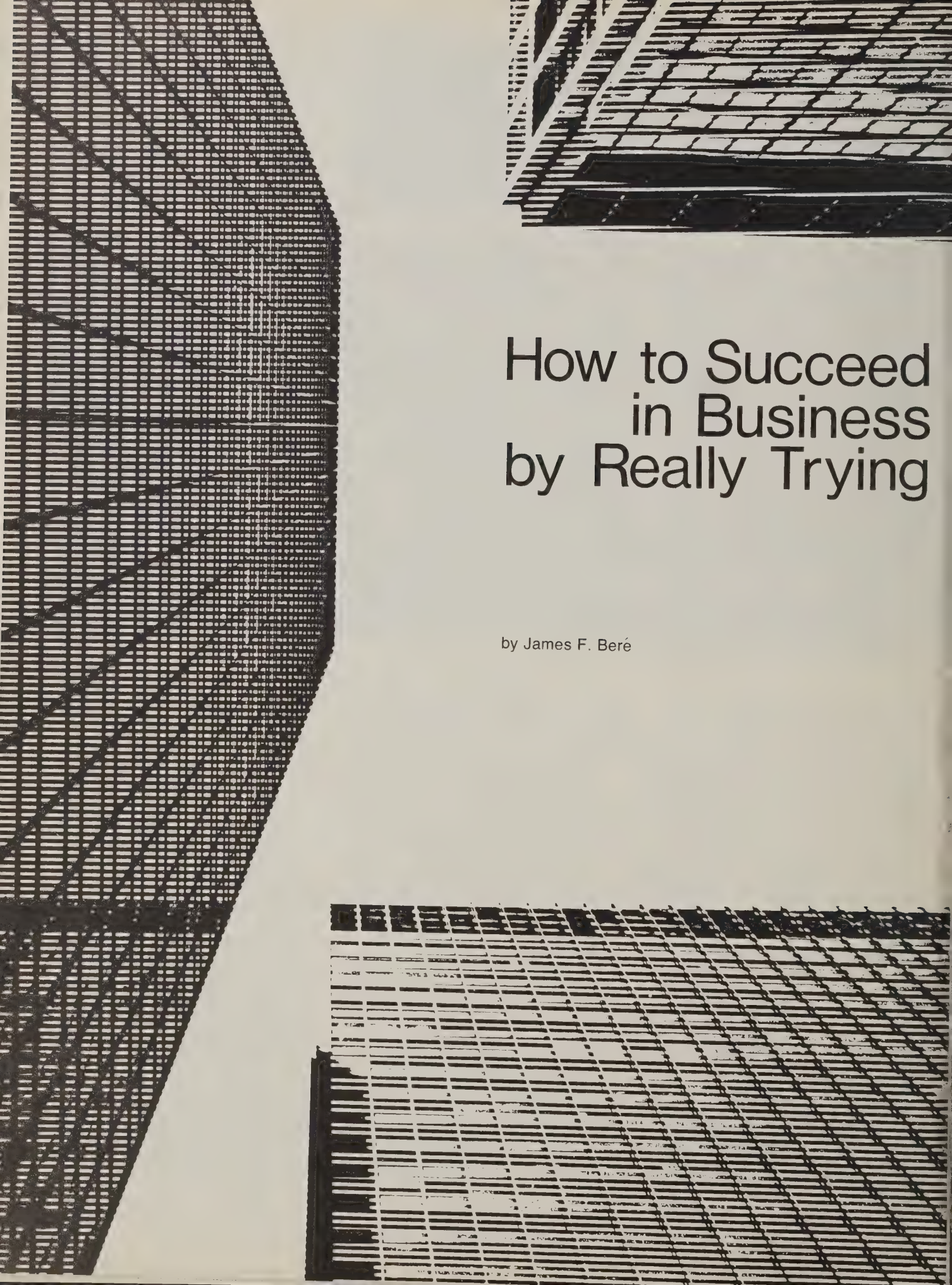
ment ponds, the shallow ponds still were 80 times as likely to have use by aquatic birds.

The fact that these manmade marshes represent a type of habitat that is rare in Howard County accounts for their heavy use by wildlife, according to Geis. Columbia homeowners who have discussed the sediment basin matter with Geis have been "effervescent with enthusiasm in seeing animals that usually aren't found in urban areas," he said.

Besides their wildlife values, Geis said, the ponds continue to trap sediment and to store some storm runoff. And residents find that mosquitoes are no longer a problem because now there are enough natural predators to keep them in check.

Mr. Burdette is district conservationist, SCS, Ellicott City, Md.

Ms. Gugulis is public information officer, SCS, College Park, Md.



How to Succeed in Business by Really Trying

by James F. Beré

A successful executive cites the need for setting goals—not only for yourself, but for the organization you want to head some day. But, he says, enjoy your work as you go.

Men and women in the broad ranks of middle management are in the best of all possible spots today. Despite constraints on companies' growth, the very problems they face require increasing numbers of skilled managers. Opportunities for advancement are abundant—but not so the supply of people who can be advanced.

If you're in the ranks of the qualified, your chances of making it to the top could be better than ever.

The top, in this case, means not just the chief executive officer, but those score or more of top jobs in any company that have president in the title: senior vice-president, executive vice-president, group vice-president, or plain vice-president, not to mention treasurer, controller, and chief counsel.

If you're like most middle-managers, you have a good idea whether you have enough education or need that Master of Business Administration degree, if you should seek an overseas assignment, if you're compiling the record of achievement that demands a close look, if you match up against others of your age and experience. If you can complete that assessment and feel good about your chances, you probably have your sights set on a top job.

However, if your goal is to be a chief executive officer or one of those other top officers, concentration on that goal might be hurting your chances of making it. You'll be looking so far into the

future you probably won't be focusing on your biggest opportunity: your present job.

Even worse, you'll be thinking so much about your career that you'll be missing the fun of getting there. Too many people, including those on the inside, think of business as so grim that they don't enjoy themselves.

Here, then, is some advice on how to succeed in business by really trying. And by enjoying yourself while you're at it.

Nothing mystical or revolutionary is involved in these suggestions. Instead, they're the do's and don'ts most successful managers learn to follow—by instinct, by experience, by advice.

The importance of these fundamentals escapes those who create and believe the "success without effort" theories. A recurring myth is that the key to success is to be a good politician. When I was a young manager in the 1950's, the theme of the book-musical-movie *How to Succeed in Business Without Really Trying* was a popular delusion. Another myth is that you can succeed by running over people, as witnessed by the recent book, *Winning Through Intimidation*. Both approaches are nonsense and appeal to people who don't have the ability and determination to succeed by doing their job well.

Some people who are office politicians or intimidators do succeed. However, they might do even better if they didn't direct their energies to

scheming or steamrolling to get ahead.

These suggestions also have a fringe benefit. If you're not serious about making it to the top, or if you are and don't, your career still should be more satisfying—and fun—if you follow some commonsense rules.

First, do your present job the best you can. As one of my business school professors used to say: "Do your job so that you know it better than anyone. Relate it to the goals of the total enterprise."

At the same time, enjoy your work by doing it well. As Peter Drucker put it, every management job ought to be rewarding and satisfying in itself, rather than just the means to the next job.

I found that trying to do my job better than anyone else gave me increasing satisfaction. In turn, as I enjoyed it—when the job really got to be fun—I'm sure I did it even better.

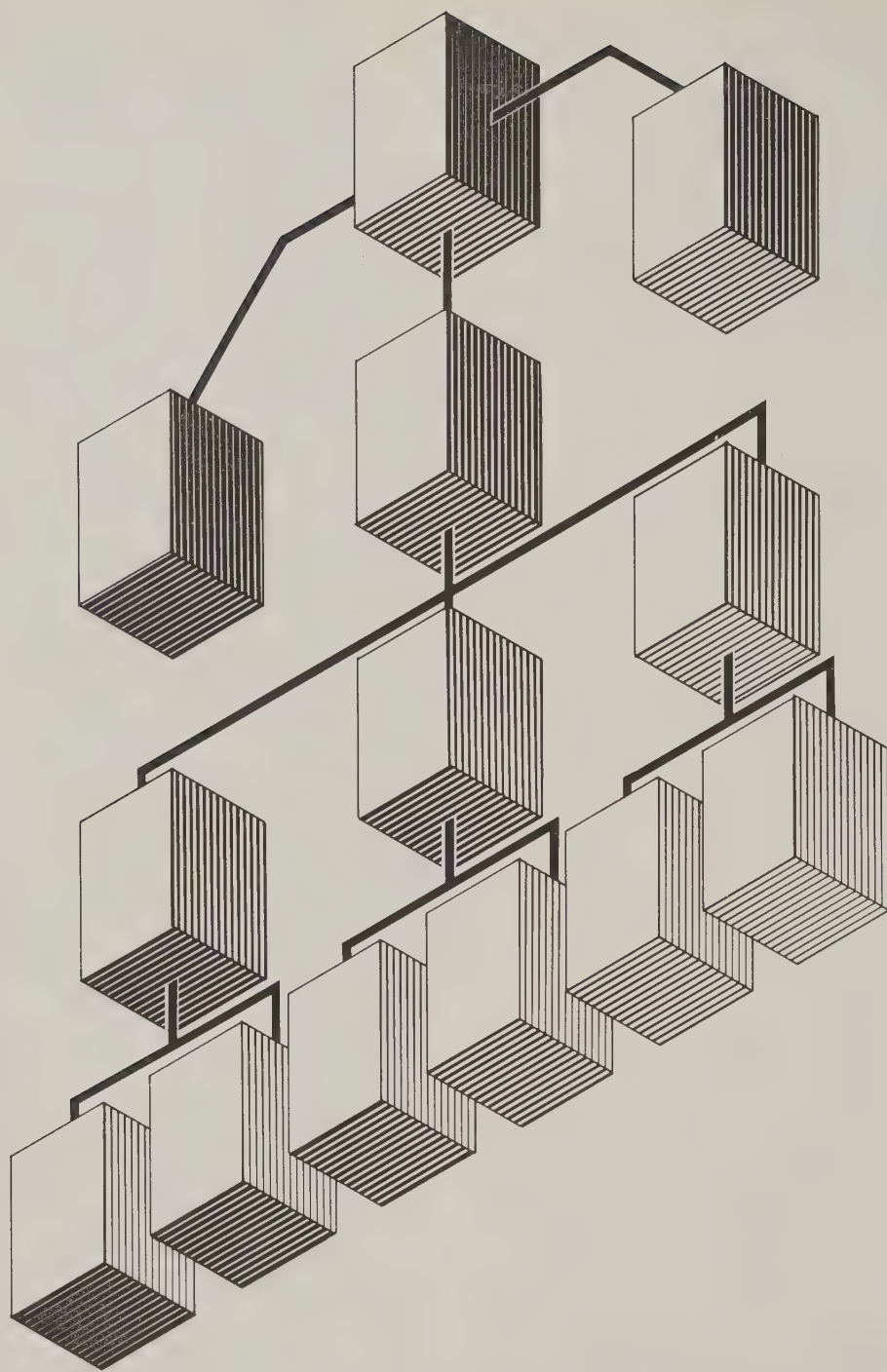
Then learn as much as possible about the next job. And do something many people overlook: train your successor.

Manage your time—it's difficult to do your job the best you can, and to enjoy yourself while you're at it, if you can't manage time. It's one of the most valuable skills anyone can have and you can't acquire it too early.

We all waste time, but most of us waste too much. One problem is distinguishing between what's important and unimportant.

Like most people, chief executive officers and others at the top tend to do what they want to do rather than what they ought. That, however, is a luxury no manager can afford. The demands

If you're in the ranks of the qualified, your chances of making it to the top could be better than ever.



Every management job ought to be rewarding and satisfying in itself, rather than just the means to the next job.

on your time are enormous and there is only so much of it.

To help me manage my time, I use my secretary and other staff people. At intervals, I keep a log, a diary, of everything I do for one full week—everything, including meetings, phone calls, even coffee breaks. I study it to learn how time could be saved. What things shouldn't be on this list? Which could be combined? For example, I spoke with one person three times in one day; could one meeting have handled it?

A word of caution: most managers keep schedules and lists of "things to do" in the belief they can plan for everything. My predecessor as president told me: "Never plan your day so rigidly you can't deal with an unforeseen crisis." Some men I knew who failed were so inflexible they couldn't see their key people unless the matter was on the schedule for that day.

Get good information on what is happening. This relates to the budgeting of time—because it takes time—but it's important. The basic element for getting good information, of course, is the "nervous system" of any business: good, reliable financial controls. But they're not enough. If financial controls were the only input, business would be in trouble because those controls react mainly to the past, or at best, to the present.

Get out among the people running the business: talk to employees, customers, and suppliers. Most experienced managers can feel the difference between the climate of an organization with good morale and one with problems. You pick up the vibrations.

The higher up the ladder you go, the more important is the question of what to do with the information you collect. The rule here is, don't act precipitously, don't usurp the authority of subordinates. Don't stroke your ego because you like to see something tangible happen. It takes discipline not to overreact, but it's a habit that has its own reward. By the time all of the facts are in, you will find that the problem rarely is as one-sided as it first appeared.

Not acting precipitously is part of learning how to make timely decisions. Too many executives, anxious to

We all waste time, but most of us waste too much. Managing time is one of the most valuable skills anyone can have, and you can't acquire it too early.

manage aggressively, get trapped into thinking that they must act now or lose the opportunity.

If somebody tells me at 11:45 a.m. that we need a decision by noon, my instinct is to tell him to wait. The chances are that he's overreacting.

Be decisive; don't procrastinate. During the Civil War, one of Lincoln's commanders, General McClellan, kept telling the President he could strike if only he had more soldiers. When he got them, the weather wasn't right. Basically, McClellan didn't want to make a decision.

This lack of decisiveness, the inability to act when action is needed, is often a greater barrier to progress than the problem itself. You have to learn to use judgment, to find the middle ground between impulsive action and delaying a decision until you've passed the critical point.

It's important to read widely and well. I try to read in many areas: not just business literature, but history, philosophy, current events, classics. I read the biographies of great leaders, not to imitate them but to understand what makes people succeed.

Just as valuable as reading widely is experiencing widely. The best move I made after college was to work in the machine shop in my first job. I not only found out how things really are made, but I gained insights into the attitudes of hourly workers that I couldn't have gotten any other way. After that, I tried to work in as many other departments as possible so that I could understand how all of a company's operations fit together.

One "do" that is overlooked is to set personal objectives, not for yourself, but for the kind of company you someday want to head. The young manager who has a vision of the kind of com-

pany he or she wants to head will try to create that kind of company now. First a department, then a plant. Both the manager and the company will be the better for it.

You do all these things, and you make it to the top. Now what?

Most important, the job still should be satisfying most of the time. There isn't any such thing as total satisfaction from any job; we can't be happy at our work all the time. We all are human and we have our highs and lows. We have disappointments; we make mistakes; we create hurt when we don't want to. But if the satisfaction isn't there most of the time, then the job is wrong.

The chairman of a major corporation who retired a few years ago said he couldn't recall one day when some business problem wasn't worrying him, keeping him awake at night. That's the wrong job.

At the same time, you have to learn to accept the constraints of success. One young manager asked me: "Isn't it rewarding to have the freedom to do as you wish?"

"It doesn't work that way," I replied. "The greater your responsibility, the less freedom you have. You set the tone for the other managers, and sooner or later your management style filters down and influences your associates. It isn't that you're forced to act differently than you'd like, it's just that you're more conscious of the impact that your habits and attitudes have."

One of my greatest satisfactions is being a talent scout: finding and selecting people, helping train them, working with them, watching them grow. Perhaps the hardest lesson to learn, however, is don't try to be universally loved or admired. If that's your

goal, you'll fail. You don't have to seek approval; it will come if it's deserved.

You should consider the welfare of your associates and employees as important as your own. Doing this won't guarantee success, but without this attitude, success will be hard to come by. Looking at your associates as people is critical if you are to develop the trust that's required for you, in turn, to exercise leadership.

To develop trust, you have to act in such a way that others will recognize that you're acting not in behalf of your personal interests, but in behalf of the organization and the welfare of others in the organization. The more mutual trust you can inspire, and the more openness you can create, the more freedom each manager will have to act without fear of being misunderstood.

Showing concern and developing trust is something you don't have to wait to do until you reach the top. Now is a good time.

Mr. Beré is chief executive officer, Borg-Warner Corporation, Chicago, Ill.

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Illustrations by Christopher Lozos.

Most experienced managers can feel the difference between the climate of an organization with good morale and one with problems. You pick up the vibrations.

Spraying a slurry of hydromulch and grass seed helped hold the soil at a newly constructed aquatic center.

Erosion Didn't Have a Chance

Frequent watering and applications of fertilizer helped establish substantial growth of the combination warm and cool season grasses in about 4 weeks. Solid sod strips were put across the drainageway where grass seed wouldn't have time to take hold.



From the looks of the Edmond Aquatic Center, the development of a new community park in Edmond, Okla., is off to a good start. City officials made sure ground cover was planted to prevent erosion on disturbed areas as soon as construction was completed on the first phase of the project—an Olympic size pool, separate diving well, and a bathhouse.

The soil at the pool site is fine sandy loam that erodes easily when disturbed, and erosion control was especially needed on areas that sloped away from the pool and the parking lot.

"We wanted to have the soil covered by winter," said Harry Francis, parks director for Edmond. "We knew we'd be in good shape next spring if we could establish at least a temporary cover of cool season and warm season grasses this fall."

A mixture of bermudagrass, bluegrass, ryegrass, and Kentucky 31 tall fescue seed was combined with hydromulch and water and sprayed onto the disturbed areas around the pool.

The hydromulch is fibrous material that holds the soil while the seed

comes up. Applications of fertilizer and frequent watering helped establish substantial growth in about 4 weeks.

Solid sod strips were put across the drainageway where grass seed wouldn't have time to take hold.

The city of Edmond is also planning to build two shelters, restrooms, a concession stand, a small pond, and a trail system for bike riders and pedestrians. There will also be areas for nature study. A ballfield on land reclaimed from a sanitary landfill is already completed. Park facilities are planned to eventually cover about 90 acres.

The Soil Conservation Service provided soils information to park planners through the Planning Department of Edmond. SCS also assisted the Oklahoma County Conservation District with the "A-95" review for the aquatic center which is required by the Office of Management and Budget.

Thirty to 40 percent of the county is in urban development, and the A-95 review gives SCS an opportunity to insure that conservation measures are considered in land use planning for the many municipalities, according to Al Conradi, SCS district conservationist for Oklahoma County Conservation District.

The Bureau of Outdoor Recreation of the U.S. Department of the Interior provided cost-share assistance for purchasing land for the park through its land and water conservation program.

"One of our main objectives in planning the park was to leave as much land as possible in its natural condition and to preserve the native grasses and trees," Francis said.

This not only helps prevent erosion and sedimentation, but results in areas that are easier and less expensive to maintain. Francis says, "If we can't maintain it, we won't build it."

Ms. Garlitz is a writer-editor, Information Division, SCS, Washington, D.C.



Al Conradi, SCS district conservationist for Oklahoma County Conservation District (right), Bill Dashner, city manager for Edmond (center), and Harry Francis, parks director (left) discuss how they "held the soil" at the newly constructed Edmond Aquatic Center.

Don Glisson, SCS district conservationist, gives high school students a lesson in catfish management during the Field Day.



Diversified Farm Hosts Ecology Field Day

High school students in eastern North Carolina learn about agriculture and its relationship to resource management by visiting a conservation farm.

by Frank H. Jeter, Jr.

Biology teacher Martha Glisson wanted her students to learn more about soil and water conservation. She decided that a visit to an operating farm would give her students and others in Nash County, N.C., high schools some firsthand experiences with conservation.

Six years ago, Glisson met with representatives of the County Board of Education, the Nash County Commissioners, the Nash County Soil and Water Conservation District (SWCD), and the Soil Conservation Service to plan a program and establish goals for an Ecology Field Day.

Since Nash County is located on the fertile North Carolina Coastal Plain, the planning team decided that the major thrust of the annual Field Day should be to broaden the students' understanding of the interrelationships between agriculture and proper management of the area's natural re-

sources. North Carolina's Forest Service, Wildlife Resources Commission, and Extension Service offered to help with instruction.

Glisson's husband, Don, who is SCS district conservationist in Nash County, contacted I. C. "Ike" Lamm, a cooperator with the Nash County SWCD, who agreed to hold the Field Day on his 1,000-acre farm.

During this year's Field Day, representatives of the cooperating agencies gave about 1,500 students detailed information about such varied topics as use of soil surveys, cropping systems, erosion control practices, woodland management and fire control, and the need for wildlife habitat and food sources.

Conservation plays an important part in Lamm's farming program. He has installed terraces and grassed waterways which collect and hold runoff water from storms. His cover

crops, permanent pastures, and field borders lessen the impact of wind and water, keeping the soil in place. Lamm is particularly interested in controlling erosion because he wants to keep sediment out of ponds where he raises catfish for commercial markets. In addition to his commercial catfish operation, he raises cattle, grows tobacco, harvests sawtimber, and manages ponds for catfish, bass, and bream fishing.

The diversified farming operation and the variety of conservation practices make the Lamm farm an ideal place to teach soil and water conservation.

Mr. Jeter is public information officer, SCS, Raleigh, N.C.



Wealth of Water

If everybody in Mississippi wanted to go fishing twice a year, Mississippi's farm ponds could accommodate them, provided the landowners were willing. And many are.

There's a wealth of water in Mississippi's farm ponds. More than 224,000 surface acres are in the 132,277 ponds that dot the landscape from Pascagoula to Horn Lake.

These privately owned ponds provide water for cattle, for irrigating gardens, and for fire protection. They also brighten the leisure hours of thousands of farm families.

The farm pond is one of Mississippi's earliest conservation practices. The Soil Conservation Service has been assisting landowners in locating, designing, staking out, and managing ponds ever since the agency was established in the early 1930's. Working through soil and water conservation districts, SCS provides technical help to Mississippi cooperators on the nearly 1,500 new ponds they build each year.

In Mississippi, farm ponds are used for a variety of activities, from fishing for fun and profit to irrigation and fire protection.

In 1976, SCS assisted 6,510 cooperators seeking information on pond management. SCS biologists test water quality, check fish populations, and advise on stocking rates and weed control.

There is a constant demand for fingerlings for stocking new ponds and restocking old ones. Most ponds are stocked with bass and bream which the Mississippi Game and Fish Commission helps deliver from the U.S. Fish and Wildlife Service hatcheries near Tupelo and Meridian.

Ponds especially designed and managed for catfish have created a whole new industry. From some 16,000 acres in fish production, Mississippi farmers harvest about 40 million pounds of catfish each year. Most of the State's catfish ponds have been designed and built with technical assistance from SCS.

Attracting wildlife is an added benefit of farm ponds. Some landowners put up nesting boxes for wood ducks along the banks of tree-lined ponds.

The ponds also provide food and water for raccoons, squirrels, and quail and other birds who tend to make their homes nearby.

Irrigation is another, though not common, use of Mississippi's ponds. A good example is the W. W. Williamson farm west of McComb, where Williamson uses pond water to irrigate the gladioli he grows for commercial markets.

Debris basins, which are mainly used to trap silt from eroded areas, are constructed in many Mississippi counties. But where landowners are able to solve their erosion problem, these basins can make beautiful ponds.

Yes, there's a wealth of water in Mississippi's ponds. They are a priceless water resource created by conservation farmers.

Ms. Fleming is public information officer, SCS, Jackson, Miss.

Hobby Leads to Model Woodland

by Ernest A. Christie

Through their interest in conservation, a Kansas family has a model woodland to supply their woodworking hobby.

Five years ago it was a 17-acre patch of wasteland brush and scrub. Now it's a thriving walnut and wild cherry orchard.

The combination of a family's woodworking and conservation interests made the difference. Robert and Sue Dubois, who farm 2,000 acres near Burlingame, Kans., purchased the woodland tract to produce material for their hobby of handcrafting furniture and other home accessories.

Robert Dubois said he felt the land had good potential, but that few others would have agreed. It was crowded with low-market-value trees and was so overgrown with brush that he had to bulldoze several trails before he could begin management improvements.

A Cooperative Extension Service forestry specialist helped him develop a timber improvement plan that he is carrying out with cost-share assistance from the Agricultural Stabilization and Conservation Service.

Dubois removed the undesirable

trees and saved a number of existing walnut, wild cherry, and hackberry trees. Then, he began pruning the walnut trees to develop better logs.

Dubois also planted walnut seedlings along creeks and established an orchard of other types of nut trees. The Soil Conservation Service, through the Osage County Conservation District, provided soils information and helped select planting sites.

During the past 5 years, the Dubois family has harvested about 2,000 board feet of walnut and about 1,500 board feet of cherry lumber. Much of the harvest goes into production of an array of home accessories including plaques, bed headboards and footboards, tables, children's furniture, and cabinets.

"Although we have sold some walnut for fireplace mantels and have traded some wood stock, we consider our woodcrafting primarily as a relaxing hobby," Dubois said.

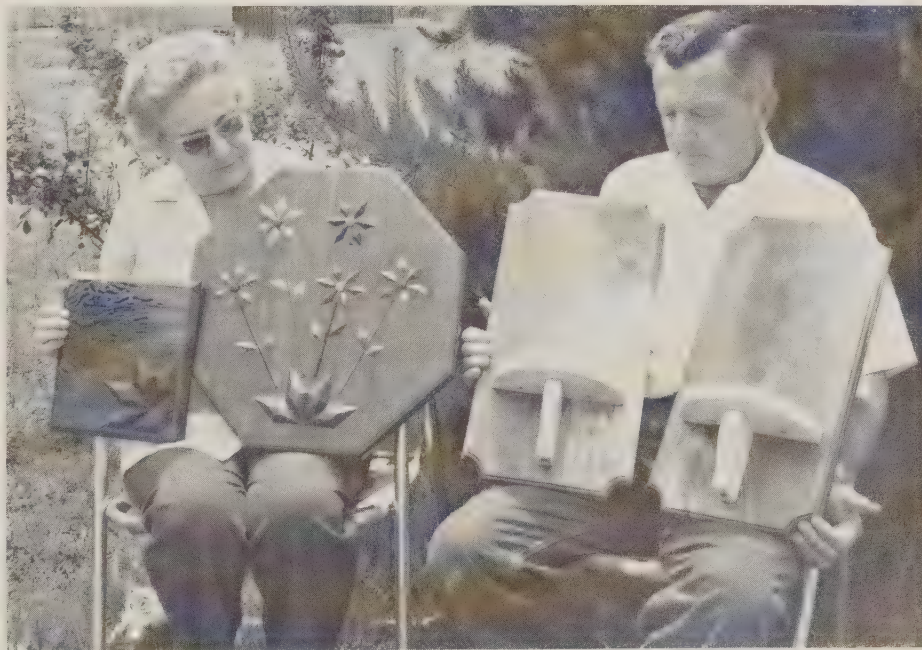
Dubois takes care to harvest only

mature or damaged trees—for management considerations as well as esthetic reasons. "I particularly like to use stumps and forked branches, which a commercial logger can't afford to save, since they make the most attractive furniture," he said.

In 1974, the American Tree Farm System recognized Dubois as the Kansas Tree Farmer of the Year.

"Over the years, our woodland efforts have become part of our overall farming operation," Dubois noted. "Our conservation plan covers both woodland and cropland, and we're able to handle our timber stand work in the winter when we're not busy in the fields."

Mr. Christie was district conservationist, SCS, Osage City, Kans., and is now retired.



Robert Dubois grafts an improved nut variety on parent stock. Dubois and his wife, Sue, manage their woodland to provide a source of material for their hobby—handcrafting furniture and other home accessories.

News Briefs

How Grassland Management Affects Range

Scientists at Oklahoma State University will study the effect of grassland management on range condition, runoff, and water quality under a cooperative agreement with the U.S. Department of Agriculture (USDA).

With up to \$30,000 provided by USDA's Agricultural Research Service, university scientists will conduct a 2-year study to determine the effects of vegetation and soil management on range condition.

The scientists will observe closely the vigor of different species of vegetation as well as turf composition.

Results from the research may be applied to infertile areas of sloping grassland to help make the soil more productive and may also help the environment by improving erosion control.

Air Force Base Wins Conservation Award

Griffiss Air Force Base, in Rome, N.Y., won the 1976 Secretary of Defense Natural Resources Conservation Award.

The award is presented annually to the military installation in the United States that has made the most progress, over a 3-year period, in applying resource conservation measures to the land. Competition for the 1976 award was restricted to installations of 5,000 acres or less.

At Griffiss Air Force Base, land managed for fish and wildlife was increased by 750 acres, more than 4,000 square yards of paved areas were converted to natural plantings, 228,000 seedlings were planted on 240 acres, and a wildlife refuge was developed on land reclaimed from a sanitary landfill.

The Soil Conservation Service provided technical assistance to the planners, the engineer, and the landscape architect on the base through the New Hartford field office.

Mine-land Reclamation Research Grants Awarded

Land-grant universities in 13 States will share almost \$800,000 of Federal grant funds for research in mine-land reclamation.

The grants are being made by the Cooperative State Research Service, U.S. Department of Agriculture. The money was made available from the Environmental Protection Agency through an interagency agreement.

Scientists in the Northeast will study "orphan-land" reclamation, sulphur-related problems, hardwood seedlings, and mine-soil property variations. In the North Central States, they will study short-term weathering effects, crop rotations, alder use, deep tillage, the use of remote sensing, and soil profile characteristics in relation to mine-land reclamation.

Researchers in the South plan to study acid-forming minerals, adapted mycorrhizal fungi, and direct seeding of commercial forest trees. In the West, scientists will research sodium hazards, species adapted to disturbed areas, cultural practices for vegetation, water harvesting on saline media, mine-soil resources, the effects of topsoil depth, and the use of legumes for revegetation.

The universities involved are: West Virginia, University of Maryland, Pennsylvania State University, Texas A&M University, University of Kentucky, Purdue University, Iowa State University, University of Alaska, University of Missouri, Colorado State University, Montana State University, Utah State University, and New Mexico University.

Assessing Soil Fertility

A new method of measuring and assessing a soil's fertilizer needs by simulating the rate of flow of phosphorus and potassium ions through the soil and into plant roots has been devised.

Results from the new method compare favorably with traditional chemical tests for soil fertility without the usual risk of undue chemical alteration of the soil. It is expected that by using the new method, four or five soils

could be completely analyzed daily. Current chemical tests provide only partial analysis of a soil; several separate tests must be run to obtain a complete analysis.

It is now generally accepted by agronomists that the diffusive rate (rather than solution flow) at which nutrient ions such as phosphorus and potassium move to a plant's root zone determines a plant's uptake of these nutrients which, in turn, determines how well the plant grows.

The diffusive rate of these nutrient ions depends on soil fertility. By measuring this rate, USDA Agricultural Research Service scientists have developed a simple method to characterize the soil's fertility.

The measuring is done with two soil-resin cells that simulate chemical conditions in the root zone of the soil. An untreated soil is used in one cell while in the other cell the same soil fertilized only with phosphorus and potassium is used. After the nutrients in the soil are partially depleted by the resin, they are extracted from the resin and measured.

Researchers from ARS and Montana State University developed this new method.

Farm Population Decline Accelerates

The U.S. farm population in 1976 was 600,000 fewer than in 1975, the U.S. Department of Agriculture reports. The farm population now is 8.3 million people, about 15 percent below the 1970 figure.

According to the USDA Economic Research Service report, "Farm Population Estimates for 1976," the number of farm residents appeared to be leveling off in the early 1970's, with an average low 1.2 percent a year rate of decline from 1970 to 1974. But, since 1974, the average annual rate of loss has increased to 5.8 percent.

Even with this recent acceleration, however, the rate of decline over the past 7 years has been only 2.7 percent annually, much lower than the 4.8 percent annual rate from 1960 to 1970.

While the farm population continues to drop, there has been a recent increase in the entire rural population.

The population in nonmetropolitan areas, now growing faster than the metropolitan population, climbed 6.6 percent from 1970 to 1975, compared to the metropolitan growth of 4.1 percent.

The West contradicts the national trend in farm population with its increase of 50,000 farm residents since 1970. All other areas of the country have shown declines in farm population.

The South lost more farm residents than any other area of the United States in 1976, and has lost almost a fourth of its farm residents since 1970. The South, with 2.9 million farm people, ranks second in farm population to the 3.8 million in the North Central States.

About one person out of every 26—3.9 percent of the total U.S. population—lived on a farm in 1976. In 1916, when the number of U.S. farm residents reached its peak, about one person in three lived on a farm.

Wildflower Seed on Market

Seed of the native wildflowers, 'Kaneb' purple prairieclover and 'Nekan' pitcher sage, released by the Soil Conservation Service, are now available commercially. Seed growers in Kansas and Nebraska have produced crops that are ready to go out to seed dealers, nurseries, and garden stores.

'Eureka' thickspike gayfeather seed, also released by SCS, will be available later in 1978 because it takes 2 years to produce a seed crop. SCS provided foundation seed from plantings of the three native forbs to commercial growers in the fall of 1976.

The three plants were selected from trial plots after many years of observation at SCS plant materials centers and then went out to commercial growers for increase and distribution. The selections were made in cooperation with State crop improvement associations, State experiment stations, and the USDA Agricultural Research Service.

'Kaneb,' 'Nekan,' and 'Eureka,' were selected for their abilities to control soil erosion, and to restore and beautify pastureland, rangeland, and roadsides.

Meetings:

January

3-6	Catfish Farmers of America, Atlanta, Ga.
8-12	American Farm Bureau Federation, Houston, Tex.
8-12	National Council of Farmer Cooperatives, San Francisco, Calif.
9-13	North American Game Breeders and Shooting Preserve Association, San Antonio, Tex.
17-21	National Wool Growers Association, Inc., Denver, Colo.
22-25	National Association of Home Builders, Dallas, Tex.
24-26	National Cattlemen's Association, New Orleans, La.
31-Feb. 2	Southeastern Section of the Society of American Foresters, Birmingham, Ala.

February

5-9	National Association of Conservation Districts, Anaheim, Calif.
5-10	Society for Range Management, San Antonio, Tex.
17-20	American Association of School Administrators, Atlanta, Ga.
19-22	National Association of Manufacturers, Washington, D.C.
21-22	Southern Forest Institute, Inc., Atlanta, Ga.
26-Mar. 1	Land Improvement Contractors of America, Las Vegas, Nev.
26-Mar. 3	American Society of Photogrammetry, Washington, D.C.
28-Mar. 3	American Camping Association, Anaheim, Calif.

March

12-16	American Concrete Pipe Association, Atlanta, Ga.
17-19	National Wildlife Federation, Phoenix, Ariz.
19-22	North American Wildlife and Natural Resources, Phoenix, Ariz.

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Strengthening the Partnership

From the Administrator

The Soil and Water Resources Conservation Act of 1977 will attune SCS programs more closely to the Nation's conservation needs, help conservation districts make their local programs more effective, and give more citizens a chance to share their ideas.

The new law (see page 23) calls for SCS, in cooperation with districts and State agencies, to take a comprehensive look at our soil and water resources. This appraisal will provide information on the condition and quantity of resources in each county. Districts can use the information to pinpoint their most critical needs and set priorities for action.

SCS will continue to monitor these resources. We can compare data collected over the years with our base information to see how effective ongoing conservation programs are and what new approaches may be needed.

Districts can use the same process to determine whether local efforts are meeting their goals. Working through State agencies and the National Association of Conservation Districts (NACD), they also will have a hand in developing the 5-year national conservation program specified in the law. A committee of district and NACD people already is helping us plan how to implement the law.

We also must involve individual citizens in the planning to assure that the 5-year program will meet the conservation needs of individual land users as well as the Nation.

Districts can encourage public input by conducting open meetings to explain the upcoming resource appraisal, to discuss conservation needs, and to solicit ideas we can use in developing policy and carrying out our mutual work.

USDA also will be continuously evaluating progress and effectiveness of our programs and reporting yearly to Congress. The suggestions of State and local groups and other interested people will be not only welcome but vital to our responsiveness.

Through one of the most effective partnerships in history, SCS, districts and State conservation agencies, and private landowners have helped place soil and water conservation practices on millions of acres. Public Law 95-192 recognizes the strength of that partnership and is aimed at making it still more effective in the years ahead.

A handwritten signature in cursive script that reads "Mel Davis". The signature is written in dark ink and is positioned at the bottom of the page, below the main body of text.

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

Prepared in the Information Division
Soil Conservation Service
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Cover:

In areas of rugged terrain in Utah, soil surveys are made using helicopters. An article about using helicopters for soil surveys in Montana and Alaska, as well as Utah, begins on page 10.

Soil Conservation

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A grassland area in California, once in danger of drying up, is now being managed for wildlife.

Planning Habitat for Wildlife



The soil is too poor and the rainfall too low for farming, but an area referred to as "the grassland" in Merced County, southeast of San Francisco, Calif., is one of the major wintering grounds for waterfowl along the Pacific Flyway.

The area covers 100,000 acres, most of it private land maintained for waterfowl. It attracts several hundred bird species, including ducks and geese, each winter.

About 10,000 acres of private land are managed according to long-term Water Bank Program agreements with the U.S. Department of Agriculture. Under the agreements, farmers and ranchers preserve and improve their wetlands as nesting and breeding areas for waterfowl. The Soil Conservation Service provides technical assistance for the cost-shared improvements, which are incorporated in conservation plans. Some 3,000 pairs of ducks—cinnamon teal, gadwell, and mallards—nest and raise broods on water bank land in Merced County.

State wildlife areas or national wildlife refuges cover 20,000 acres, and additional land is maintained for waterfowl by duck clubs.

Troubles for the area began in the 1920's, according to Jerry Cawthorn, manager of the Los Banos Wildlife Area in Merced County for the California Department of Fish and Game. With the building of dams in the Sierras about 50 years ago, much of the

water that flooded the waterfowl area each year was diverted to other uses, such as irrigation, power production, and municipal use. Many wetlands dried up late in spring, depriving ducks and other birds of a place to nest and raise their young. In addition, the droughty, saline-alkali soils produced few food and cover plants for upland game animals.

SCS provided detailed information on managing the poor soils for wildlife habitat and designed water distribution systems. The SCS plant materials center at Lockeford, Calif., supplied trees, shrubs, and seed for experimental planting. Of particular interest were plants capable of furnishing wildlife food and cover while competing successfully with other species.

"We didn't have time or money to nurse plants along," said Cawthorn. "New plants had to make it on their own."

SCS also redesigned a drainage system for a parking lot and check station offices at the 3,200-acre Los Banos Wildlife Area. The paved area is drained by gravity rather than by pumps, and the runoff is diverted into the wetlands. The drainage system design saved the California Department of Fish and Game \$150,000, which was used for other waterfowl improvements.

The Los Banos Wildlife Area was purchased in 1929 to provide habitat

for waterfowl. It is one of three State wildlife areas in the county.

"We now have more than 200 species of birds, including 30 species of waterfowl," Cawthorn said. "Mammals here include coyote, gray fox, beaver, mink, badger, and weasel."

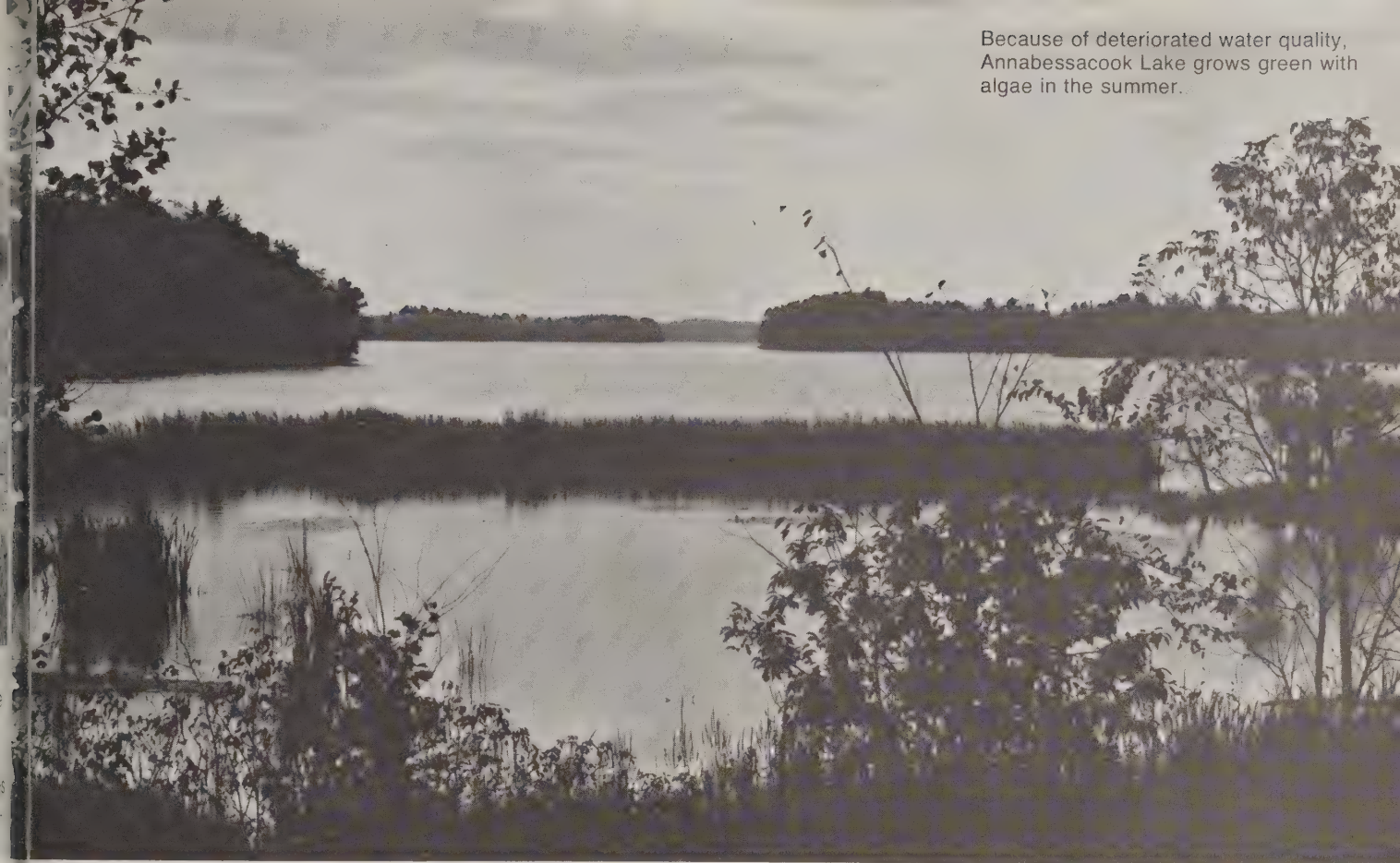
"This is what makes our job worthwhile," he added, "to take a poor piece of ground like this, that won't support anything but saltgrass and iodine bush, and create quality habitat for wildlife."

The management techniques and plantings that prove successful at the refuges are shared with other conservation district cooperators. Each year, Cawthorn conducts a tour of the wildlife area for SCS personnel and district cooperators. He instructs participants in marsh plant and animal species identification and discusses wetland management.

Four resource conservation districts (RCD) serve the area: Grasslands RCD, Gustine-Romero RCD, San Luis RCD, and Los Banos RCD. The Grasslands RCD has a staff biologist to advise cooperators on water distribution systems and on how to manage their land for waterfowl.

Ms. Bell is a public information specialist, SCS, Davis, Calif.

Because of deteriorated water quality, Annabessacook Lake grows green with algae in the summer.



Residential waste was suspected of polluting three lakes. But a Federal grant helped finance the search for the real cause and begin efforts to improve water quality.

by Judith E. Ladd

Maine Lakes Get Double Treatment

As in a typical detective novel, the first suspect was not the culprit.

In 1975, Cobbossee Watershed District (CWD) employees set out to find the reasons for deteriorated water quality throughout the watershed surrounding Winthrop, Maine.

"The area is not primarily agricultural, so residential waste was suspected to be the pollution source at the time we began our studies," said Tom Gordon, CWD executive director.

The effort began with formation of the special watershed district by the State Legislature in 1971. Legislators were particularly concerned about declining water quality in Cobbossee Lake, Annabessacook Lake, and Pleasant Pond. The three lakes are used for recreation and as a water supply for nearby towns.

Until a sewer line was completed in the Winthrop area in 1972, large quantities of phosphorus entered Annabessacook and Cobbossee Lakes in municipal sewage and industrial waste. Although the discharges were

Below, various kinds of manure storage facilities will be built on farms in the lakes area. At right, Clement Smith (center) discusses plans for a manure storage facility on his dairy farm with Kathy Sage, CWD agricultural coordinator, and Tyler Libby, SCS district conservationist.



diverted to the Augusta sewage treatment facility, the lakes still suffered from severe nuisance algae blooms.

In 1975, the Environmental Protection Agency (EPA) awarded a grant to the Southern Kennebec Valley Regional Planning Commission under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). The Planning Commission contracted with the Watershed District to monitor water quality and to analyze nonpoint source pollution and private sewage disposal. During the study, the Watershed District determined that the lakes were suffering from phosphorus overenrichment, which caused the water to turn green with algae.

Although many of the thousands of camps on the lakes have septic systems they were found not to be responsible for the continuing problems.

"We started out suspecting that more regulation of lakeside camps, cottages, and homes would be needed—but that just wasn't the

case," said Gordon. District studies showed that after the removal of industrial and municipal point sources, agricultural runoff from the area's dairy and poultry farms became the leading source of phosphorus in the lakes, he said.

In 1977, EPA awarded a 2-year, \$278,000 grant for 50-percent funding of the Watershed District's Lakes Restoration Project. The Watershed District, the Maine Department of Environmental Protection, the Annabessacook Lake Improvement Association, the Agricultural Stabilization and Conservation Service (ASCS), and the Kennebec County Soil and Water Conservation District (SWCD) will share the rest of the project cost with participating farmers.

One objective of the project is the installation of manure storage facilities and other runoff control measures on dairy and poultry farms. Because of the high cost of building winter manure storage facilities (from \$5,000 to \$36,000 each), most farmers have not been able to afford them.

With the help of funds from the EPA grant and cost-sharing assistance from ASCS, farmers will be able to build the needed waste control measures. ASCS also will administer the grant money that is earmarked for agricultural work.

Without storage facilities, farmers pile or spread manure on frozen fields. During spring runoff, much of the manure is carried into streams which eventually empty into the lakes.

About 40 farmers have agreed to cooperate with the Kennebec County SWCD in this part of the project. The farmers will receive technical help from the Soil Conservation Service in developing conservation plans that incorporate effective storage facilities. The plans also will include information on rates and timing of manure applications to fields, on locations where manure can be applied at a safe distance from bodies of water (based on soils information), and on livestock exclusion.

"Construction will begin in spring, with the most critical problem areas



Wendy King and Dave Dominie of the Cobbossee Watershed District test visibility (above left) and take readings of dissolved oxygen and temperature (above) on Annabessacook Lake.

handled first," explained Tyler Libby, SCS district conservationist in Augusta. The facilities will provide 180-day storage, allowing farmers to apply the manure to hayfields and cropland when there is less chance of runoff.

"Studies of a similar project in New York showed a 50 to 75 percent reduction of phosphorus in streams after manure storage facilities were installed," said Kathy Sage, CWD agricultural coordinator for the project. "We're looking for at least that amount of control."

Another objective of the Lakes Restoration Project is treatment of 1,420-acre Annabessacook Lake, the second-largest of the three lakes, with alum.

Phosphorus which has accumulated in lake bottom sediments is being recycled back into the water, causing continued algae blooms. The alum treatment is designed to stop this internal recycling of phosphorus by precipitating the phosphorus to the bottom of the lake and holding it there.

Assisted by the Maine Department of Environmental Protection, the Watershed District is conducting laboratory and inlake tests to determine if the alum treatment will be effective.

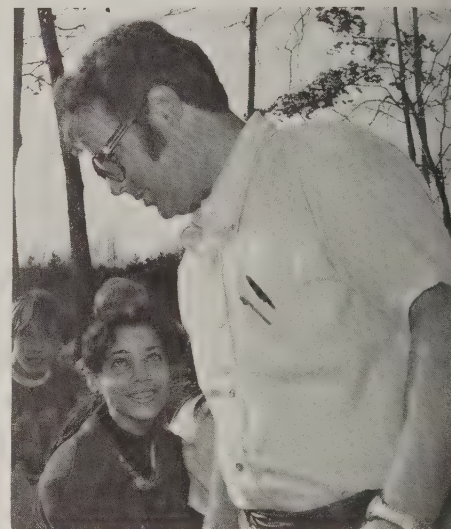
"The alum treatment phase of the project is still in the research stages to determine if it is feasible and to make sure it won't have any detrimental effects on the lake," said Kathy Sage. "The treatment has been used successfully on smaller lakes but never on one as large as Annabessacook."

Careful planning and cooperation from landowners, according to Tom Gordon, will help the Cobbossee Watershed District achieve its goal: To restore water quality to the lakes and to establish sound land use practices to keep them clean.

Ms. Ladd is editor, *Soil Conservation*, SCS, Washington, D.C.



At left, Conservation Teacher of the Year James David and biology students evaluate pond microbiology at the outdoor study center. Below, Robert Brooks of Spartanburg, S.C., is the second-place winner.



Conservation Education Is a Winner

Outstanding teachers and conservation districts are rewarded for their work in helping young people understand more about conservation of our natural resources.

Every year the National Association of Conservation Districts (NACD) and Allis-Chalmers Corporation sponsor an Environmental Conservation Education Awards Program. The purpose of the program is to give national recognition to teachers and conservation districts for outstanding environmental education activities and to encourage more effective use of education programs to increase public understanding of conservation problems and environmental issues.

The 1977 Conservation Teacher of the Year is James R. David of Flagstaff, Ariz., and the winning district is the Gaston Soil and Water Conservation District (SWCD), Dallas, N.C. Each won a \$1,500 prize for first place and an expense-paid trip to the NACD national meeting in February 1978, for the awards presentation.

David's prize-winning entry, nominated by Coconino Natural Resource Conservation District (RCD), was developed by Flagstaff Junior High School students who established an outdoor learning center on a drainage area formerly used as a trash dump. (See "Outdoor Study Center Rises from Mudflat," October 1977 *Soil Conservation*.) David, head of the biology department, and his students also won a Bicentennial Youth Program award for the learning area,



At left, Gaston Soil and Water Conservation District, Dallas, N.C., is the first-place winner in the district category with a program that included helping 18 schools with outdoor classrooms. Below, Pulaski Conservation District, Little Rock, Ark., won second place. Students participated in many conservation projects including tree planting.



which includes a study trail and wildlife habitat improvement.

Gaston SWCD, under the leadership of Chairman R. Wilson Barnett, won first place among districts with a broad-based program that included help with outdoor classrooms for 18 schools, teachers' workshops, and assistance to a variety of youth groups. Through the Comprehensive Employment and Training Act, the district hired a full-time environmental education coordinator, Melissa Jones, who worked with schools and prepared a booklet on using outdoor classrooms. She also developed an activities guide in environmental studies for teachers in grades 3 through 6.

Second place awards of \$300 each were won by Robert A. Brooks, Jr., Spartanburg, S.C., in the teacher category, and Pulaski Conservation District (CD), Little Rock, Ark., in district competition.

Brooks, the science teacher at Campobello-Gramlin Junior High School, along with other faculty members and students, developed a 3-mile learning trail on the school site. It is used by groups of teachers attending certification workshops conducted by Brooks. Specially trained student leaders serve as guides and instructors for environ-

mental studies on the trail. Brooks has prepared a teaching guidebook for the trail which includes plant identification and soil maps of the area prepared with the help of the Soil Conservation Service. His entry was sponsored by Spartanburg CD.

Pulaski CD placed second with a program under the leadership of Chairwoman Mary L. Ratcliffe that has involved most of the community. A radio and TV conservation campaign netted more than 200 hours of public service time. Total commercial dollar value of the donated time was estimated at almost \$120,000. Pulaski CD also sponsored a Junior Board of 65 members who last year constructed a greenhouse at Jacksonville High School, staffed a State fair booth, sponsored a poster contest, and helped with several tree planting projects.

In addition to the national cash awards, each winner in the NACD regional judging received a \$200 prize.

Southeastern region won two national awards: Robert Brooks, Spartanburg, S.C., second place in the teacher category, and Gaston SWCD, Dallas, N.C., first place in the district category. Southwestern region was represented in the top winners by James R. David, Flagstaff, Ariz. South Central region's

Pulaski CD, Little Rock, Ark., was in second place in the district category.

Other regional district winners included: Northeastern region, Lebanon County CD, Lebanon, Pa., George B. Wolff, chairman; Upper Mississippi region, Green County SWCD, Monroe, Wis., William F. Reimer, chairman; Northern Plains region, Ellis County CD, Hays, Kans., Wesley Bittell, chairman; Southwestern region, North Cache and Blacksmith Fork CD, Logan, Utah, with Valden Pitcher, chairman of North Cache and Jay Bankhead, chairman of Blacksmith Fork; Pacific region, Clatsop SWCD, Astoria, Oreg., Howard B. Johnson, chairman.

Regional Conservation Teacher of the Year winners included: Northeastern region, Gerald Beals, Plymouth CD, Brockton, Mass.; Upper Mississippi region, Roger Zulauf, Morgan County CD, Jackson, Ill.; Northern Plains region, Connee Quinn, Todd County CD, Mission, S. Dak.; South Central region, Cheryl Hollingshead, Garland County CD, Percy, Ark.; Pacific region, Gerald Stoops, Redlands-Highland-Yucaipa RCD, San Bernardino, Calif.



Amphibious planes, as well as helicopters, are used to survey Alaskan soils.

Soil Surveys Take to the Air

Soil scientists are taking to the air to speed information to land users, to dig their augers into previously inaccessible soils, and to map vast expanses of untamed land.

by Anne Schuhart



Today, when information about the Nation's soil and water resources is in more demand than ever, soil scientists are finding the helicopter to be as valuable a tool as the shovel. Teams of the scientists flying over a survey area can distinguish and map soil boundaries by using background information and by touching down periodically to sample the soil for "ground truth."

Aerial mapping provides ample soils information for planning grazing and other low intensity land uses. Detailed soil surveys, which require soil scientists to walk over the land and map acre by acre, are designed for cropland, urban development, and other more intensive land-use planning.

Western States, with many areas of native rangeland, lead the Nation in using helicopters for mapping soils.

Montana

Using a helicopter, four Soil Conservation Service soil scientists mapped 600,000 acres in Phillips and Garfield Counties, Mont., in less than 15 days.

The Bureau of Land Management (BLM), U.S. Department of the Interior, requested the soils information to use in writing management plans and environmental impact statements. BLM is

charged with preparing environmental impact statements by the end of 1978 for land it administers. Until the statements are completed and approved, no improvements, such as crossfencing or stockwater ponds, can be made.

BLM lacked soil surveys for most of the land it administers in Montana. "This was one of the big gaps," said Mike Rollins, BLM soil scientist at Billings. "We had no information for Garfield and Phillips Counties."

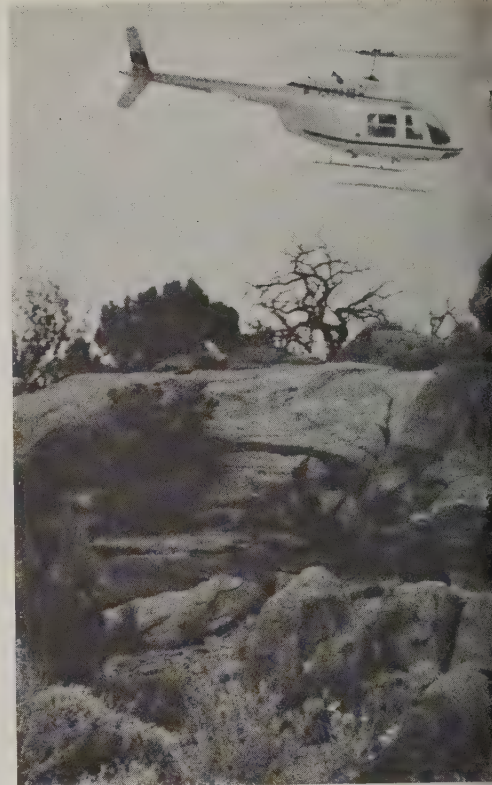
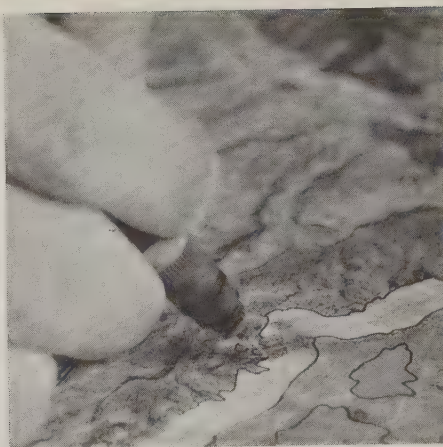
BLM soil scientists are not involved in the actual mapping of soils. "We mainly apply the soils information in land-use planning," Rollins explained.

"If we had to do the mapping here, it would take us 3 to 4 years to acquire the skill needed to complete the soil survey so quickly. It takes a team of experts to do anything like this in such a short time," he added.

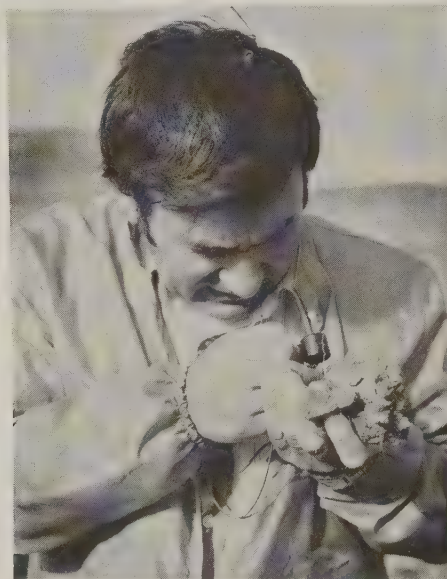
SCS was prepared for the job, said Jack Rogers, SCS State soil scientist. "We had already completed detailed soil surveys of land adjacent to most of the area, and the climate and parent material are quite uniform. We could accurately predict the kinds of soils and map them."

The actual mapping took only 14½ days, as compared to about 7 months

In Utah, soil scientists ink in predicted soil boundaries on aerial photographs before field work begins.



Gerald Simonson (left), professor of plant and soil science at Oregon State University, works with Sam Short, SCS range conservationist in Montana, and Robert Richardson (right), SCS soil scientist in Montana, in identifying range plants and describing soil type.



Robert Richardson, SCS soil scientist in Montana, uses a hand lens to study a soil's mineralogy—a factor used to determine soil type.

it would take one person to walk the land. But much preparation was made before the helicopter took off.

BLM supplied aerial photographs of the area and marked section corners and ownership boundaries. The SCS soil scientists then delineated major landscape features on the maps.

Using completed surveys for areas around the two counties and drawing on their knowledge of the soils, climate, vegetation, and landscape features, the SCS soil scientists prepared descriptions of the soils they expected to find. Without all the background data, even flying around in a helicopter wouldn't do the job, they agreed.

Once in the air, the soil scientists had the helicopter touch down often so that they could examine the soils to confirm their predictions. "Where the soils were different from what we expected, we modified or expanded the descriptions," Rogers said.

Sam Short, SCS area range conservationist at Lewistown, worked with the soil scientists in identifying the existing and potential vegetation for each of the soils.

"BLM needs the soil survey for planning the best management of rangeland. A properly designed, low



At left, helicopter shuttles Utah survey crew from Sixshooter Peak region to the road head at day's end. Below, Mark Beroz, SCS soil scientist, directs helicopter pilot to investigation site in Utah using aerial photographs.



intensity soil survey provides enough soils data to help achieve that objective," said Rogers.

Utah

A helicopter proved to be the only practical means of access to more than a million acres of rugged canyonlands in eastern Utah.

BLM requested a soil survey of the Canyonlands Area, a section of the Colorado Plateau between the Colorado River and the Utah-Colorado State line. This section of the plateau ranges in elevation generally from 5,000 to 7,000 feet and is dissected by numerous canyons that drain into the Colorado River. Its mesas, benches, and valley floors are separated by very steep escarpments.

Much of the rough terrain limits travel to four-wheel-drive vehicles. Many isolated mesa tops defy all surface vehicles and can be reached only by using rock-climbing gear or by helicopter. Some of these are very important as "relict areas" for studying soil and plant relationships, because they have not been disturbed by livestock or wildlife.

After nearly a year of mapping the more accessible parts of the area,

three field teams assembled early last summer to begin mapping from a helicopter. Each team consisted of a soil scientist from the local survey party, a soil scientist from the SCS State office at Salt Lake City, and a range conservationist.

The soil scientists selected sample sites and directed the flights. They also inked in the soil boundaries on high-elevation, quad-centered aerial photographs.

The range conservationists identified plants and determined the condition and potential of the native range. With this information, the soil scientists could compare similar soils in different locations because each soil has a potential plant community with a certain composition and production.

The three teams worked on adjacent maps. The helicopter flew almost continuously, setting down one team to sample the soil, picking up and moving the second and third teams, then going back to move the first team again, allowing each team about 30 minutes on the ground to describe the soils and vegetation.

At lunchtime, the teams gathered at a central location to coordinate and discuss the morning's work while the

helicopter carried soil samples back to a spot selected for refueling.

Much of the Canyonlands Area is ideal for aerial mapping, because land-form boundaries are sharp, vegetation is sparse, and rock outcrops can be easily identified. Most soil boundaries could be quickly located and mapping unit composition readily estimated from the air.

The helicopter provided another advantage. Together, soil scientists and range conservationists could observe broad landscapes and vegetation patterns and get an overall view of the relationships on the ground. The teamwork among the soil scientists and range conservationists helped tailor the survey to BLM's need for basic data to use in managing the area for livestock and wildlife.

Alaska

Using helicopters to map nearly 363 million acres of largely unsettled land in the Nation's northernmost State was not an alternative—the enormity of the job made choppers and light support planes a necessity.

The exploratory soil survey of Alaska, to be published in summer 1978, was initiated by SCS to provide

Below, soil surveyors take samples for ground truth on the lichen-covered Alaskan tundra. At right, a tract cleared of timber and brush was planted to barley in the Delta Junction area of Alaska.



information to State and Federal agencies that needed basic resource data.

"We set out to classify the soils in Alaska on a broad scale," said Clarence Furbush, SCS soil scientist at Palmer. "We really had only a general idea of the kinds of soils we had here. The survey identified potential agricultural land we didn't know we had as well as the forest and tundra soils."

Only one soil scientist at a time and the helicopter pilot were engaged in the SCS exploratory soil survey. "We carried a tent and supplies with us, and we had gas cached in bushes all around the State. We would land where the gas was cached, camp and work in the area, then go to the next cache," Furbush said.

Although the soil scientist could scrutinize mile after mile of roadless wilderness from the helicopter in a single day, it took eight summers, from 1967 to 1975, to map the land of the midnight sun.

State agencies, BLM, and various consulting firms already have used soils information gathered in the exploratory soil survey in selecting land and in evaluating proposals for land use.

"Even though the survey isn't published yet, hardly a week goes by without someone requesting soils information that we could not have provided before the survey," said Furbush.

"Now even our more detailed, medium intensity soil surveys of specific areas are being made with the help of helicopters. For example, last summer we surveyed the unpopulated Totchaket area primarily to determine agricultural potential. In another area near Delta Junction where we identified potential agricultural land, the State plans to clear 2,000 acres and turn it over to people interested in farming," said Furbush.

"Other surveys are for a more specific purpose. For instance, an SCS soil scientist and a range conservationist made a low intensity soil survey near Kotzebue to determine the carrying capacity of the native vegetation for reindeer.

"When we make a medium intensity survey, the helicopter drops us off in the morning and then takes us back to a central camp in the evening. Sometimes the crew is moved several times a day, depending on the soil pattern," he explained. "The survey crew in-

cludes a party leader, three or four soil scientists, and field aides who carry guns."

Guns?

"Sure," Furbush grinned. "We've had some pretty hair-raising experiences.

"Just last summer, three of us soil scientists were out on an initial review of the area when a brown bear charged out of the brush right for us. I pulled the trigger, but the gun was still on safety. The bear was within a few strides so I jumped and shouted and stared him down. The bear came to an abrupt stop. Nose in the air and teeth showing, he hesitated, then turned and ran into the bushes."

In spite of Alaska's testy bears, SCS soil scientists managed to map more than 360,000 acres in summer of 1977. "Next summer, two parties using two helicopters are aiming to map a million acres of wilderness in detail," Furbush said.

"Flying in choppers can be hazardous if safety precautions are not strictly observed, but with a skilled pilot familiar with the terrain and a machine in top mechanical condition, the risks are not great," explained Furbush. "The worst experience we



Choppers transport soil survey teams, food, and equipment to remote base camps.

Channel changes of a typical Alaskan river create a pastoral impression in the wilderness. Soil surveys indicate that the timbered areas are potential agricultural land.

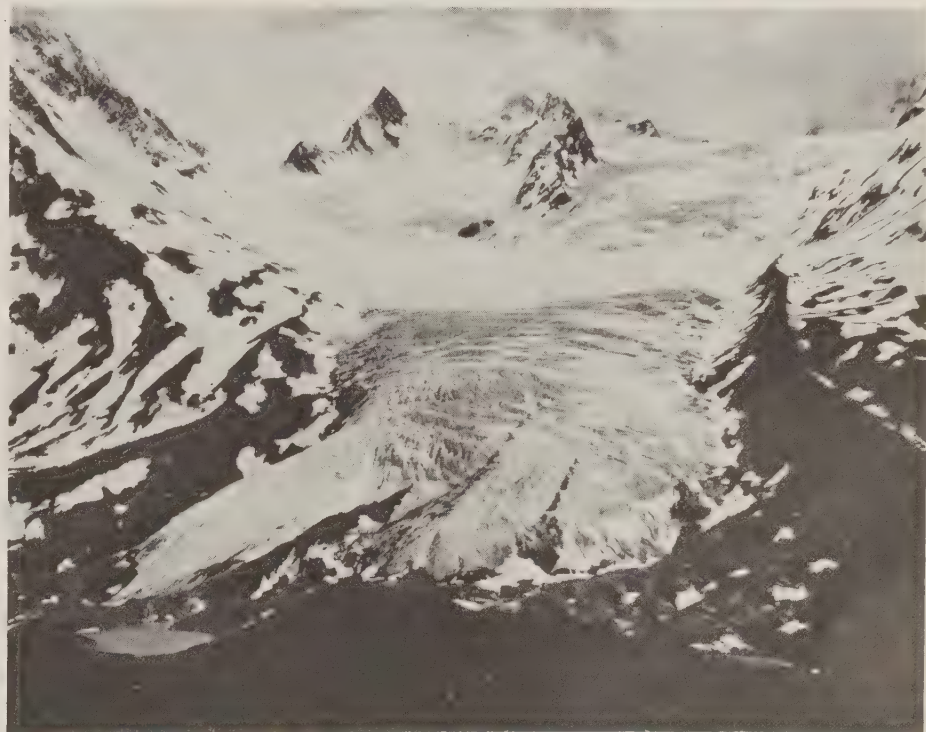


have had was when a chopper could not be started after landing because of a dead battery, and the soil scientist and pilot had to walk 30 miles to where they could be picked up by a light plane.

"We've also used riverboats and large-tracked vehicles. But the boats are limited to waterways, of course, and the cross-country vehicles are expensive, they can damage the tundra, and they break down often.

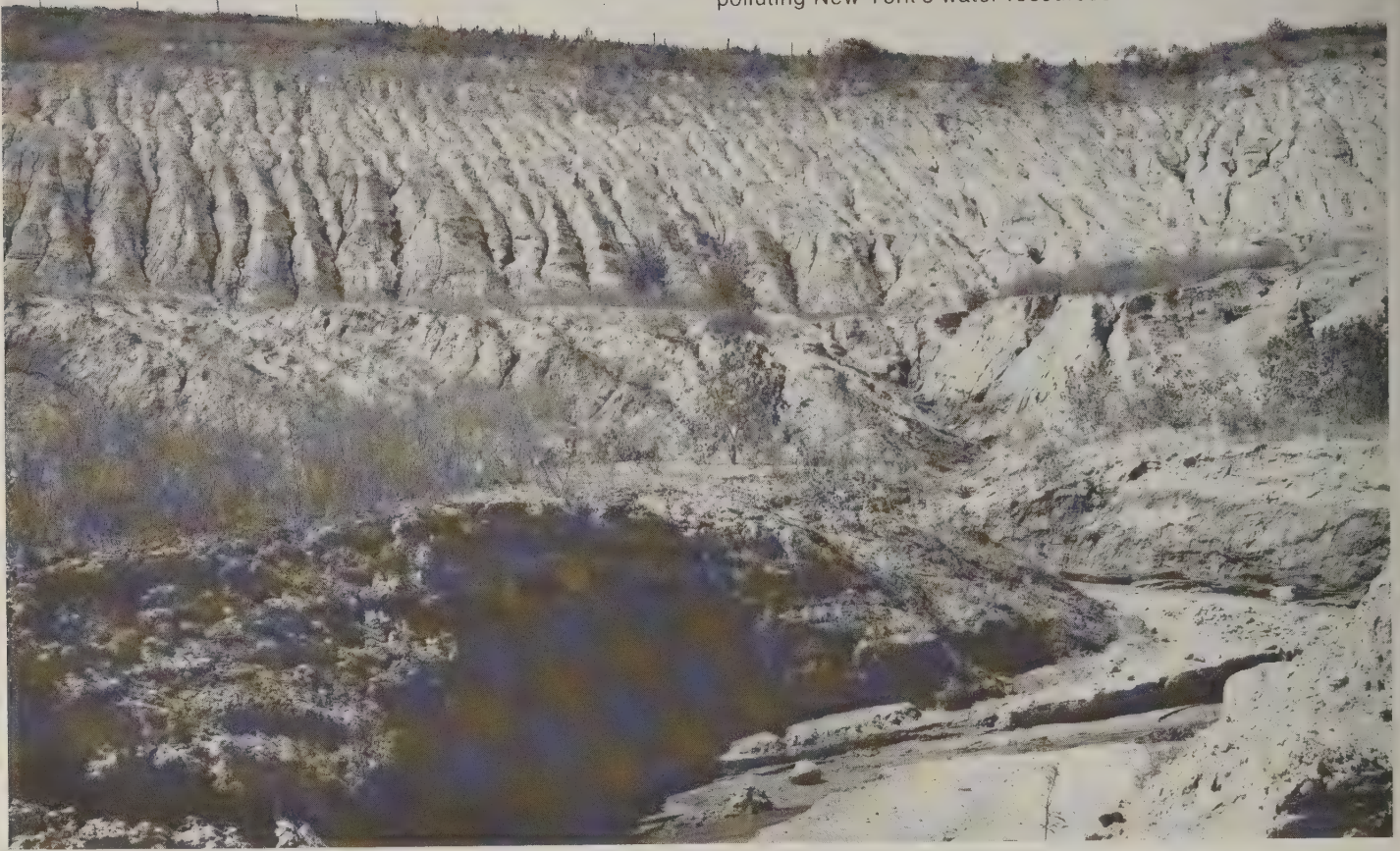
"Our season here is so short that when we can work, we take advantage of the long days. And when we have 10 soil scientists ready to map, we can't afford a breakdown."

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C. Contributing authors: Brad Anseth, public information officer, SCS, Bozeman, Mont.; and Duane Lammers, soil survey party leader, SCS, Moab, Utah.



The terminus of the Harding ice field on the Kenai peninsula of southern Alaska is a typical Alaskan glacier and shows the ruggedness of some of Alaska's 363 million acres.

Sand and silt erode from borrow area into streams and rivers, polluting New York's water resources.



Second Chance for Mined-Out Land

by Harry W. Oneth

Before 1975, sand and gravel mining in New York was good for the economy but often bad for the landscape. Now, a reclamation law gives many "mined-out" areas a new lease on life.

A multimillion dollar industry that creates thousands of jobs, a product sought by business and consumers, and production sites close to major roads and people add up to a prosperous industry and a healthy economy.

They can also add up to environmental problems—lower water quality and loss of valuable topsoil.

Mining for minerals is a major industry in New York State, and sand and gravel mining makes up a large part of the State's total income from mining.

That was the dilemma facing State legislators in 1974, when they began studying the mineral industry.

Runoff from sand and gravel mines was polluting the State's water resources: Sediment was clogging streams, filling in deep pools, and discoloring the water. Sedimentation was increasing the threat of flooding by lowering stream capacity, and it was decreasing trout populations by destroying spawning sites. Sites that held water were becoming breeding grounds for mosquitoes. Active mines were dusty, noisy, and dangerous.



A well-established stand of flatpea planted on the bank of an abandoned gravel pit provides erosion protection, beautification, and wildlife cover.

Most mines are in plain sight of main roads and residential areas, compounding the environmental problems.

Legislators tried to find a balance between what was sound for the economy and good for the environment. They passed the New York State Mined Land Reclamation Law, which went into effect on April 1, 1975. The law made conservation and reclamation integral parts of mining. It was designed to promote mining practices compatible with conservation practices and to restore lands already mined.

The law requires owners of mines producing more than 1,000 tons of material annually to register with the Bureau of Mineral Resources of the New York State Department of Environmental Conservation. Within the first 18 months, more than 1,000 mines were registered.

The Soil Conservation Service and the New York soil and water conservation districts help landowners comply with the law by providing technical assistance in planning and applying conservation measures to mined areas. How the land is to be used after mining must be de-

termined early in the planning stage so that the mining operation can support the after-mining use of the land.

Soil survey data is essential in planning post-mining uses. It helps avoid offsite damage and helps in selecting plants to revegetate mined areas.

Most sand and gravel mining sites are close to urban centers, making them good locations for housing developments. Where housing developments are planned, surrounding natural areas are disturbed as little as possible and topsoil is stockpiled during mining and protected so it can later be regraded over the mined area to support lawns and gardens. Conservation practices also include diversions, sediment basins, ponds, and tree plantings.

Mining sites can be adapted for growing trees with a minimum of land grading, and water recreation areas can frequently be included in mined land reclamation plans.

Natural waterways and existing vegetation are used wherever possible to divert upstream water away from the mining site, helping contain site-produced

waste within the mining area. Most operations use diversions, sediment traps, and basins for controlling erosion.

Wooded areas surrounding mining sites are left undisturbed and more trees are planted where they are needed to control dust and noise.

At most sand and gravel mines, trees are planted or temporary fences put up to screen them from view. Sometimes fast-growing trees are planted for immediate cover and more durable species planted where they will be needed for a long time.

The State's Department of Environmental Conservation, SCS, and the conservation districts are cooperating to make the new mined land reclamation law workable and effective. They're helping maintain a healthy economy and a healthy environment for New York.

Mr. Oneth was State resource conservationist, SCS, Syracuse, N.Y. He is now an assistant State conservationist, SCS, Huron, S. Dak.

Terracing, one of the most successful conservation practices in Missouri, is getting support from plastic tubing.

by Donald L. Diehl

Plastic Tubing Goes Underground



Wayne McReynolds (left), SCS district conservationist, and Hunter Stallings examine a riser similar to the ones connected to plastic tubing installed in a terrace on Stallings' farm.

In Saline County, Mo., where the practice of terracing is more than 50 years old, the use of corrugated plastic tubing—which is less than 10 years old—is allowing many farmers to combine an old system and a new material, usually ending up with more land to farm.

Farmers who have been using terraces to curb soil erosion have found that now they can get even more productivity by installing the new subsurface outlets, commonly referred to as tile outlets. Productivity is increased because the area formerly in grassed waterways can be farmed and the subsurface outlets with terraces provide better drainage. Farmers who have not been sold on terraces in the past are now considering the system.

Installing the new plastic tubing is not cheaper than clay or concrete drain tile. It costs about \$100 to \$150 per acre to build the terraces and install the lines.

Continuous plastic tubing provides a good solution for underground outlets especially when terraces are built on steep slopes. Terraces in the past were built to drain onto grassed waterways that carried surface water from the field. Now the new plastic tubing system, with its "risers," carries the excess storm-water underground and reduces the need for grassed waterways.

Saline County is one of the top corn-producing areas in Missouri. But a large percentage of the land is rolling and susceptible to erosion. Terracing and contouring are the two most successful conservation practices in combating soil erosion.

Farmers like Martin Kiehl and Hunter Stallings, who both operate large farms west of Marshall, agree that the primary thing wrong with the new plastic tubing and riser system is that it wasn't developed years ago.

In 1973, Kiehl converted several acres of terraced land to the new system and reclaimed several acres of land tied up in grassed waterways. Land value is one reason farmers are considering the new system, he pointed out. In addition, he said he now has more control over the water in the field and the soil is easier to work.

Stallings agrees. He has worked with the Saline County Soil and Water Conservation District (SWCD) and Soil Conservation Service engineers to develop

a design for installing several acres of new terraces and replacing tile in other areas.

Most of Stallings' 415 acres are terraced. "The new system already has proved profitable and will be more so in the future," he said.

Both Stallings and Kiehl said people just can't continue to plow up and down the hills. And Stallings says that farmers who allow their topsoil to erode "are just stealing from us all."

But not all Saline County farmers are as enthusiastic as Stallings and Kiehl. Wayne McReynolds, SCS district conservationist for Saline County, is concerned about soil erosion. He provided help to many local farmers in installing about 100 miles of terraces in 1976. "But that's not enough," he said. "Soil continues to erode and we should be doing more."

McReynolds says that farmers usually come to the district office if they're interested in terraces or the new under-

ground outlet system. "But we can't force the issue," he said.

A lot of States now have legislation to enforce the control of sediment, and McReynolds feels such a law may be passed in Missouri eventually. Meanwhile, he relies on farmers to tell their neighbors about the advantages of terraces and contour farming.

Working closely with McReynolds' office is the Saline County Agricultural Stabilization and Conservation Service (ASCS) Committee which provides financial help to farmers who install conservation measures.

The ASCS Committee along with the SWCD board and the Saline County Cooperative Extension Service meet each year with interested people to discuss the conservation needs of the county.

In 1977, the Federal Government allocated \$128,000 to be used for conservation practices in Saline County. It is the ASCS Committee's function to distribute

these funds in areas where they are most needed.

"With the increased emphasis on food and fiber production, we feel it is in the public interest to promote soil conservation," said Robert M. Edwards, ASCS Committee chairman.

But it's no giveaway program. A farmer still has to come up with 50 percent of the cost. And there's a limit of \$2,500 that an individual farmer can receive. Nevertheless, it is estimated that conservation-minded Saline County farmers have invested a half million dollars in soil conservation practices in recent times.

Mr. Diehl is farm editor, *Democrat News*, Marshall, Mo.

Adapted from an article in the *Democrat-News* that won the 1977 CIBA-GEIGY Agricultural Recognition Award for outstanding journalism.



Newly built terraces on the Martin Kiehl farm use slotted plastic tubing instead of conventional clay tile to control soil saturation. Inspecting one of the risers, through which stormwater enters the systems, are Wayne McReynolds (left), SCS district conservationist, and Kiehl.

Prescribed burning restores prairies to native vegetation, which helps to control erosion and improves wildlife habitat.

Restoring Native Prairie Vegetation



Undisturbed areas of native prairie vegetation are rare today, but efforts are being made to restore native vegetation where it was once abundant.

The restoration of even small areas of prairie can help control erosion. According to C. M. Schumacher, Soil Conservation Service range specialist in Huron, S. Dak., plants foreign to the prairie expose the land to greater destruction by the elements than native plants. Also, native prairie grasses are attractive to some wildlife species as nesting cover, according to a study by the Iowa Conservation Commission in the mid-1970's.

One inexpensive method of prairie restoration is prescribed burning, also called spring fire management. When this practice is used, conditions for burning—such as soil moisture, wind velocity, and humidity—must be favorable.

A prairie restoration project using prescribed burning was undertaken in the unused part of the Munson Township cemetery near Cambridge, Ill. The Henry County Historical Society and the township board approved the restoration as a Bicentennial project.

During the 1930's, the 4-acre plot had been plowed, seeded to legumes, and sodded with Kentucky bluegrass (*Poa pratensis*). Indiangrass (*Sorghastrum nutans*), a native prairie plant, grew sparsely in the area.

In 1970, routine mowing of the plot

was stopped and in spring 1971, as the bluegrass began to turn green, prescribed burning suppressed it.

By fall 1971, Indiangrass grew shoulder high in the plot and other native plants such as little bluestem (*Andropogon scoparius*) and tick trefoil (*Desmodium illinoense*) began to come back.

Prescribed burning was repeated each spring for several years with continued success. After the second year, prairie forbs were more numerous. By the third year, butterfly weed (*Asclepias tuberosa*) appeared and compassplant (*Silphium laciniatum*) and rattlesnake master (*Eryngium yuccifolium*) increased in number. After 4 years, the extremely rare white-fringed orchid (*Habenaria leucophaea*) appeared in the plant community.

Botanist Robert Betz of Northeastern Illinois University, who participated in the project, found more than 50 native plants in the area in 1975.

The proportion and character of the various plants changed from year to year. By 1976, Indiangrass was no longer as dominant and was much shorter. The once dominant bluegrass was greatly reduced except around the cemetery entrance.

Some unwelcome plants, such as the wild parsnip (*Pastinaca sativa*), also appeared. The local grade school science club volunteered to remove

them by handweeding. The students had to wear long sleeves and gloves to guard against the uncomfortable skin rash caused by the wild parsnip's sap when exposed to sunlight.

The restored prairie proved to be educational. Visitors to the area during the Bicentennial year observed a diverse array of grasses and prairie flowers on land much like it was when the early settlers found it.

The experience gained in the project was later applied successfully to areas such as roadsides, railroad rights-of-way, and pastures no longer used for grazing.

Prescribed burning was also applied in fenced areas on a pasture with droughty soils that were originally scheduled for renovation by plowing and reseeding. Native grasses appeared the following year but on a limited scale. More time is required on some soils for the native plants to reestablish themselves.

The least disturbed areas offer the best opportunities for prairie restoration. Selecting the best sites for restoration requires experience with and understanding of local plant and soil relationships.

Mr. Keller is a former soil scientist, SCS, Sterling, Ill.

Using their conservation plan, residents of a Massachusetts town established a 3-mile bicycle trail.

A Bike Ride into the Past



The townspeople of Easton, Mass., built a very special bicycle path to mark the Nation's 200th anniversary—and the town's 250th.

"We in Easton are proud that we could bridge our present to our past with this bicycle path and, at the same time, build something for the future," said Robert Shephard, chairman of the town's Dual Bicentennial Celebration Committee.

"I don't think we could have done it, though, without the Soil Conservation Service and its close understanding of the land."

In fall 1974, SCS helped design and lay out the trail and develop a conservation plan for the area.

Town groups and organizations pitched in to help with the project. For example, the ecology class at Oliver Ames High School spent many days clearing brush to prepare the site for construction.

Dedicated in June 1975, the town's anniversary, the path leads cyclists, joggers, and strollers past sites rich in social, political, and natural history.

The path begins near the Ferguson family cemetery, which dates back to

1740. It continues on to Meditation Rock, which was dedicated by the various religious faiths in Easton and is a quiet place for reflection. Nearby, carefully planted shrubs and trees give cyclists a look at different types of wildlife habitat.

Next, the path passes the foundation of a hoe shop owned by the Ames Shovel and Tool Company. Founded in 1773, Ames was the first company in America to produce shovels in any quantity.

Farther along is Militia Park, where the town militia trained during the Revolutionary War and where Minutemen and townspeople gathered to form the first company to serve under George Washington.

Beyond the park is Hog Head Spring, a natural spring bubbling up through clean white sand. The Ames company channeled spring water 1½ miles through a hand-dug, stone-lined ditch to their hoe shop. More than 150 years later, one of the town's first soil conservationists, John Freitas, sunk a cider barrel around the spring to preserve its mouth.

The path follows streams, winds

around ponds, and meanders through the town forest, a healthy stand of white pine that provides shady rest stops. It leads to Borderland State Park, where it connects with 2 miles of park trails to total 5 miles of continuous cycling.

"We wanted a hard surface on the path, but we didn't want asphalt because it would take away from the natural look of the area," said Shephard. Following an SCS suggestion, the path was built of gravel and topped with 6 inches of tightly compacted stone dust to form a natural looking, but firm, surface.

The path also serves the present. Cyclists can use it to reach the community swimming pool and little league ballfield from any part of town and, for the most part, avoid busy streets.

Mr. Jones is soil conservationist, SCS, Raynham, Mass.

A soil and water conservation district board replaced its old roadside signs with new ones with the help of the Future Farmers of America.

New Signs for New Times

"People judge you by what they see of you," decided the board of directors of the Dugdemona Soil and Water Conservation District, in Winnfield, La.

That's why the board tore down all its worn and sagging district roadside signs and replaced them with shiny new ones.

"The way we figured," said Shelby Gaar, district chairman, "people driving through are either impressed or depressed when they see our boundary signs. Too often I see signs hanging by one corner, rusty and full of holes, as if the district had gone out of business. So we took a good look at our old signs and decided it was time to buy new ones."

Five metal signs were ordered from the service department of the National Association of Conservation Districts. Total cost: \$210. Neighboring districts cooperated, so that boundary signs could also display their names on one side.

The rest of the work was done by the Calvin Chapter of the Future Farmers of America (FFA).

"We agree with the FFA motto of 'learning to do and doing to learn'," commented Gaar. "The young people did a first-rate job. Our only additional expense after buying the signs was a

bucket of paint and a few bags of ready-mix concrete."

The FFA boys used the school shop to cut pipes and other metal for the signposts and frames. They also painted the posts, mixed the concrete, and erected the signs, with the whole chapter participating.

After the signs were up, the district board met with the young people at a school luncheon, where they also held a board meeting.

Both Gaar and Edward Chandler, who is adviser for the FFA chapter, felt that installing signs is an excellent way to keep young people involved in soil and water conservation activities.

"Pride in the district and in conservation work must be repeatedly demonstrated and practiced," said Gaar. "One good way to do this is to ask FFA and other youth groups to help keep roadside signs looking up-to-date. The young people get more interested in soil conservation, and passers-by get a favorable image of our program and our organization."

Mr. McDonald is district conservationist, SCS, Winnfield, La.



Boys from Louisiana's Calvin Chapter of the Future Farmers of America erect a new conservation district boundary sign.

Secretary Says New Law Will Strengthen Soil Conservation

According to Secretary of Agriculture Bob Bergland, a new law will enable the U.S. Department of Agriculture to begin immediately to strengthen its soil and water conservation programs.

Actions will include gathering more data to appraise the condition and quality of America's soil and water resources by 1979; setting a 5-year plan for USDA conservation assistance; and evaluating the effectiveness and progress of on-going conservation programs.

These steps are called for in the Soil and Water Resources Conservation Act of 1977 (Public Law 95-192), signed by President Carter on November 18, 1977.

"The new law will help show the effectiveness of the 40-year partnership among the Soil Conservation Service, State and local agencies, conservation districts, and individual land users," Bergland said.

"Together these groups and the public will make informed, long-range policy decisions about the conservation and improvement of our Nation's soil, water, and related resources. They will help set national policy and priorities based on the appraisal; develop a 5-year conservation program to meet the long- and short-term needs of the Nation and individual land users; and continue to evaluate what is—or should be—accomplished in SCS programs."

The appraisal and program will be presented to Congress by the end of 1979, Bergland said. His first evaluation report will go to Congress at the end of fiscal year 1982.

Meetings:

February

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| 5-9 | National Association of Conservation Districts, Anaheim, Calif. |
| 5-10 | Society for Range Management, San Antonio, Tex. |
| 17-20 | American Association of School Administrators, Atlanta, Ga. |
| 19-22 | National Association of Manufacturers, Washington, D.C. |
| 21-22 | Southern Forest Institute, Inc., Atlanta, Ga. |
| 26-Mar. 1 | Land Improvement Contractors of America, Las Vegas, Nev. |
| 26-Mar. 3 | American Society of Photogrammetry, Washington, D.C. |
| 28-Mar. 3 | American Camping Association, Anaheim, Calif. |

March

- | | |
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| 12-16 | American Concrete Pipe Association, Atlanta, Ga. |
| 17-19 | National Wildlife Federation, Phoenix, Ariz. |
| 19-22 | North American Wildlife and Natural Resources, Phoenix, Ariz. |
| 22-23 | Air Pollution Control Association Government Affairs Seminar, Washington, D.C. |

April

- | | |
|----------|---|
| 4-6 | Garden Club of America, Birmingham, Ala. |
| 5-7 | Engineering Geology and Soils Engineering Symposium, Boise, Idaho |
| 9-11 | American Pulpwood Association, Atlanta, Ga. |
| 9-12 | Association of American Geographers, New Orleans, La. |
| 17-21 | American Geophysical Union, Washington, D.C. |
| 19-21 | Hardwood Plywood Manufacturers Association, Panama City, Fla. |
| 24-26 | National Academy of Sciences, Washington, D.C. |
| 29-May 4 | American Society of Planning Officials, Indianapolis, Ind. |
| 30-May 2 | Chamber of Commerce of the United States, Washington, D.C. |

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More Action for Aquaculture

From the Administrator

Fish farming, a form of aquaculture, is attracting new interest today in the United States and around the world.

Aquaculture so far furnishes only a small part of our protein in this country, but in several nations—even industrialized ones like Japan—it accounts for a significant share. Several developing countries rely on aquaculture for more than half their protein.

There are several reasons for the growing interest in fish farming.

First, the supply of certain species of ocean fish no longer appears to be inexhaustible. Commercial fishing fleets already are reaching the harvestable limits of some species. Yet world demand for fish is expected to double by the year 2000.

Second, fish farming is more energy efficient than other types of animal protein production. The conversion ratio of feed to meat in several forms of commercial fish farming is as high as 1.4:1.

Third, fish farms can be developed on land that is poorly suited for crops. Aquaculture therefore offers an alternative for using marginal cropland without taking it out of food production.

In this country, most commercial fish farming has been limited to two species, trout and catfish. Trout hatcheries and farms in the United States go back more than 100 years; warm water fish culture, including the buffalo fish and catfish, began to catch on about 20 years ago. Commercial catfish farms reached a high of about 60,000 acres in 1974.

Despite recent leveling off of the catfish industry, it is a good bet that we have seen only the beginning of fish farming in this country. The Food and Agriculture Act of 1977 included aquaculture as "a basic function" of USDA, and new bills now before Congress would accelerate fish farming development. There also is more interest in aquaculture in the scientific community.

As one USDA agency that assists fish farmers, the Soil Conservation Service has an interest in the orderly growth of the industry. Our field people help farmers assess the potential of their resources for growing and marketing fish. Those who have the right combination of resources can receive additional help from SCS in designing ponds, detention structures, raceways, and other features.

Two SCS booklets on aquaculture—*Trout Farming* and *Catfish Farming*—continue to enjoy wide circulation, evidence that many Americans share our agency's interest in the subject. We believe that strong SCS technical assistance to fish farmers will contribute much to proper growth of the industry. At the same time, our work with aquaculture helps assure the wise use and conservation treatment of still more of the Nation's land and water resources.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

One conservation practice that increased in usage during fiscal year 1977 is minimum tillage. For the annual report of SCS activities, see pages 17 through 22. (Photo, Earl R. Baker.)

Soil Conservation

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Pine City students study wildlife habitat firsthand at one of their outdoor learning sites.

Students Learn at the Gravel Pit and Beyond

In east-central Minnesota, school districts work together to bring environmental education to 10,000 students.

by Konval H. Bergum

Ten years ago, outdoor environmental education in Pine County, Minn., began primarily with two schools. Fifth and sixth grade students at Hinckley and Pine City schools were bused to a study site where representatives of various agencies presented hour-long classes on conservation.

Today, all schools in Pine County and neighboring Chisago County have their own outdoor learning sites and have included environmental education in their curriculums.

The 10 school districts in the two counties formed an environmental education consortium. Each district has a teacher who is designated as environmental education coordinator. An environmental education steering committee works with other teachers and resource agencies.

The consortium is funded through a 3-year, \$90,000 grant from the Minnesota Department of Education's Council on Quality Education. The 10 districts—Askov, Finlayson, Hinckley, Pine City, Sandstone, and Willow River in Pine County; and Chisago Lakes, North Branch, Rush City, and Taylors Falls in Chisago County—were already cooperating in other subjects. In 1975, they decided to apply for the grant to coordinate environmental education programs.

"The superintendents wanted to improve environmental education for all 10,000 students in the 10 districts," said Project Director Howard Teague.



A swampy section of Pine City's Natural Area gives students a close look at wetland habitat.



Students help develop their outdoor sites with activities such as tree planting.

The first step, once the consortium was organized more than 2 years ago, was to determine what assistance the area's 445 teachers needed to conduct environmental education in their classes. Once the teachers' needs were identified, the consortium worked district by district to meet them.

One tool that was developed for the teachers is the "Environmental Education Planning Guide." It describes environmental learning goals for students at each grade level and suggests more than 100 activities that can be carried out with classes in almost all subjects—from science and social studies to music and math.

The guide also has maps of each school's outdoor learning site, important historic and geologic information, and lists of individuals and agencies to contact for assistance in teaching environmental education.

"The guide is the product of ideas from more than 400 teachers," noted Teague.

Soil information is being furnished on all school sites in Pine County by the Soil Conservation Service.

Pine City was a leader in environmental education, having developed two outdoor learning sites before the consortium was formed. In 1971, the Pine City schools obtained an abandoned 72-acre gravel pit that had provided highway construction material. Area residents considered the gravel pit an eyesore. But when the hole

began filling with water, they thought it might have potential for wildlife habitat and for students to learn firsthand about the outdoors.

The Pine City School Board selected a committee that included the natural resource agencies in Pine County to plan the use of the area and named Dave Trampe, Pine City vocational-agriculture instructor, committee chairman. Working through the Pine County Soil and Water Conservation District, SCS mapped the soils of the area and worked with students in vocational agriculture classes to develop a conservation plan. Funds from many sources were used to carry out the plan.

One objective of the plan was to make the site natural looking. The rough side slopes of the gravel pit were smoothed and leveled. In addition, several ponds with islands are being built on the site. The plan also called for prairie development, tree planting, wetland development, and wildlife food plots. About 1 acre is being left to return to its natural state.

"Pine City's second outdoor learning site is a unique area," observed Jane Hill, Pine City elementary teacher and environmental education coordinator. "It has about 8 acres of virgin hardwood which have never been pastured. The remainder of the area is swampy with open, shallow water or open meadow. We've identified many types of wild flowers and plants."

The teachers and students want to leave the 35-acre site as a natural area. The few necessary trails and observation points will be located in such a way as to cause a minimum of destruction while students are studying.

"Many of the faculty and students are involved in the planning process, and we want all teachers and students to feel at home on the site and use it," Hill stated.

The consortium, which is under the direction of the superintendent and one school board member from each of the 10 school districts, has secured a \$25,000 Comprehensive Employment and Training Act grant to develop trails and make other improvements at Pine City and seven other school-owned outdoor learning areas—some 1,900 acres of land. The schools in the consortium are sharing skis, snowshoes, soil augers, and other outdoor learning tools.

"By being in the consortium, the schools have participated in 3 years of intensive production of ideas and materials. Now, the individual school districts have an environmental education program they can carry out on their own or with other districts once the funding from the Council on Quality Education runs out," said Teague.

Mr. Bergum is district conservationist, SCS, Hinckley, Minn.



New System Controls Dairy Waste

A winding waterway leads to better waste management on a dairy farm east of Lincoln, Nebr.

by Marvin D. Keebler
and Willard F. Jones

A long, grassed waterway snaking downslope from a loafing shed, feed bunk, and cow lot is the key to dairyman John Ronhovde's new waste management system.

The gravity serpentine, or switchback, waterway is about 600 feet long and 15 feet wide along its bottom. Its slope ranges from 0.4 to 2 percent, following the natural slope of the land.

Runoff and liquid waste not absorbed before reaching the end of the waterway flow into a 1-acre field sink, where they evaporate or seep into the soil. The field sink also holds excess runoff from heavy rains.

The system includes a debris basin at the head of the waterway. Two screens in the basin trap solids carried by storm runoff from the confinement lot.

Washwater from the milking parlor drains through a buried pipe into a holding pond that can collect 800 gallons a day for 120 days. The holding pond's outlet drain is unique. It is a plastic pipe that contains a plastic orifice plate. A rubber toilet plunger covers the hole. The plunger's wooden handle, encased in a riser, extends to the top of the pond

At left, Ronhovde's dairy waste facility consists of a debris basin with screens to trap solids (left), a holding pond with capacity for 120 days' washwater from the milking parlor (right foreground), and a field sink (right background). As seen from the air (below), a grassed waterway winds its way between the debris basin and field sink.



—courtesy, University of Nebraska.

embankment. With the handle, the rubber cup can be lifted off the opening to allow the stored liquid to drain out through the lower half of the waterway and into the field sink.

The system is self-contained. Clean runoff is diverted from the polluted areas and into a nearby creek.

"The system seems to be working okay," said Ronhovde. "We also need to build a manure storage bin on a concrete slab for easier handling and disposal of solid waste."

Currently, manure is scraped from the barn floors and confinement lot and hauled directly to fields of milo, corn, wheat, and alfalfa, where it is spread as fertilizer. The storage bin will help keep manure from accumulating in the buildings and on the lot when weather does not permit spreading.

"The one problem we have is that the seepage in the field sink is slower than we thought it would be because the liquid tends to concentrate at one end. We may grade the sink so that it has a level bottom," Ronhovde added.

Ronhovde requested an inspection of his dairy, and in summer 1976 received

a notice from the Nebraska Department of Environmental control that the operation required a livestock waste control system.

"We were concerned about stream pollution because our dairy is right on the banks of Nemaha Creek. We expanded our herd from 70 to 110 cows during the past 2 years and paved our cow lot, which increased runoff.

"We originally thought about just installing a dike to keep runoff from entering the creek," said Ronhovde, a cooperator with the Nemaha Natural Resources District for 30 years. He also considered other waste disposal systems, but they were too expensive.

Through the district, the Soil Conservation Service made a topographical survey of the confinement lot, buildings, and the area below and drew up a plan for the waste control system. Engineers from the University of Nebraska Cooperative Extension Service and the Agricultural Research Service contributed design features and ideas.

Ronhovde accepted the plan and found that the project qualified for financial assistance from the Agricultural

Stabilization and Conservation Service through the Agricultural Conservation Program. His outlay was less than \$2,000 of the total \$4,000 cost.

"The biggest advantage of the system was that we were able to use our present solid waste removal equipment and avoid additional investments," said Ronhovde. "The profit in the dairy business these days isn't enough to warrant very big expenditures."

Mr. Keebler is area engineer, SCS, Lincoln, Nebr.

Mr. Jones was a soil conservationist, SCS, Lincoln, Nebr., and is now retired.



A watercourse once choked with silt, debris, and vegetation now provides youngsters with a place to fish.

by Katherine C. Gugulis

Farmers and "city folks" join together to clean out a pre-Revolutionary tax ditch—and solve a common problem.

Tax Ditch Cleanup

In Dover, Del., a 4-mile-long water removal system solves both rural and urban natural resource problems.

Called a "tax ditch" because adjacent landowners are assessed for its maintenance, the watercourse drains about 2,100 acres, including two housing developments, a low-income housing project, two city parks, and several farms.

Although the ditch dates back to colonial times, it was last cleaned by the Civilian Conservation Corps in the late 1930's. Since then, it had become clogged with silt and debris and overgrown with phragmites, a common marsh plant. Recent urban development had increased the amount of runoff, which topped the low banks and flooded yards and cropland after every rain.

"When we annexed this area to the city of Dover, we annexed a lot of prob-

lems along with it—and one of the biggest was standing water," said Jack R. Woods, public works director for Dover. "The only way to solve it was to clean out the existing ditch."

However, getting the cooperation of the 17 landowners and several jurisdictions whose property abutted the watercourse was no small feat. In fact, the city's first attempt failed, said Woods.

The rural landowners downstream wanted and needed the water removal system as much as their city neighbors, but they believed that the city should pick up the tab since the development upstream had increased the runoff.

The city turned to the Kent Conservation District, and things began to happen. With technical assistance from the Delaware Division of Soil and Water Conservation and the Soil Con-

One benefit of the cleaned-out tax ditch for farmers is improved soil moisture conditions.



Roland Garrison, chairman of the tax ditch association, explains how he involved his neighbors in the project.



Area residents no longer have soggy yards.

servation Service, the district ran a survey, drew up a property map, and prepared a plan.

Using funds provided by the State and the Kent Levy Court, the district agreed to pay 75 percent of the first construction contract and 50 percent of the second. The city agreed to pay the remaining costs.

"Usually, the tax ditch commissioners take the estimated cost of the project and allocate a certain amount to each landowner. The landowner receives one vote for each dollar he's assessed," explained Fred Mott, SCS district conservationist.

In this case, the landowners were allowed to retain their voting power. That way, the tax ditch is administered by the local people.

According to Mott, much of the project's success was due to Roland Garrison, chairman of the tax ditch

association. "Roland was the one who rallied his neighbors to the cause," he said.

"Farmers are always a little suspicious of city boys," Garrison said. "Some of the neighbors would come by and we'd talk about what they might be up to. Mostly, we didn't want the city to dump any more water on us. We finally got together though, and the neighbors realized that cleaning out the ditch would also improve soil moisture conditions on their farms."

After 2 years of planning followed by a public hearing and referendum, the landowners donated permanent rights-of-way and the cleanup started. The finished water removal system cost about \$75,000.

Even though the city picked up the local share of that total, the tax ditch was still a bargain, according to Woods. Eventually, the city will recoup

its investment in terms of an increased tax base as development expands and land values in the area go up.

The ditch already has made a soggy section of Dover habitable for the city folks and provided the country folks with an outlet for their waterlogged fields.

However, the most rewarding aspect of the project, said Woods, is the outstanding cooperation demonstrated by all the folks and the local, State, and Federal agencies involved.

Ms. Gugulis is public information officer, SCS, College Park, Md.

The Cooch family faces the greatest battle on its farm since the American Revolution.

by Gordon L. Leckie

The Approach at Cooch's Bridge

SCS Soil Conservationist Marianne Hardesty and District Conservationist David Nash inspect new growth on grassed waterway—one measure installed to control sedimentation on the Cooch family farm. At right, Marianne Hardesty checks one of the numerous duck boxes planned to encourage wood ducks to nest on the farm.



Two hundred years ago, the British Army threatened the farm at Cooch's Bridge in northern Delaware. Today, six generations later, Wilmington Attorney Edward Cooch is fighting to protect the New Castle County landmark from another enemy—erosion.

On September 3, 1777, while Colonel Thomas Cooch was away raising funds for the Continental Army, his farm became the site of the only battle of the Revolution to be fought on Delaware soil. After defeating George Washington, General Cornwallis claimed the Cooch house for British headquarters.

Nearly 200 years after the battle, the Cooch family farm claimed another first: it was the first in Delaware to have a Long Term Agreement (LTA) for conservation work that would control erosion and restore the land.

In recent years, the land was farmed by a number of tenants who held short-term leases. Little care was taken to conserve the soil. For example, one field was planted with soybeans up and down the slope. By fall, the field was so eroded that the soybeans couldn't be harvested, and the field was left idle.

Although the farm now is surrounded by advancing urban development, Cooch thinks the location is ideal for agriculture. "The farm is about a mile south of Newark, and



David Nash, SCS district conservationist, reviews conservation plan on the farm at Cooch's Bridge.

there are a lot of people in this corridor from Newark to Wilmington," he said. "They have to eat, and I'm situated in the right place to feed them."

The LTA details a systematic way of restoring the 230-acre farm to productivity. "It's a good arrangement," said Cooch. "In 1974, the Soil Conservation Service helped me develop a conservation plan covering a 5-year period. As long as I live up to my end of the bargain, the Agricultural Stabilization and Conservation Service (ASCS) makes funds available to help the farm recover."

The LTA for Cooch's farm calls for building two grassed waterways, laying tile drains, and establishing a permanent cover of grass and trees in badly eroded areas—measures that are among the best management practices for preventing sedimentation in the area.

"There's no better method than the LTA for getting the job of conservation done," said David Nash, SCS district conservationist for New Castle County. "The first year we had some problems, though," he added.

"We had just finished grading for a 2,000-foot-long grassed waterway through a crop field on the slopes of Iron Hill, a site that was the primary source of the iron used to make Revolutionary muskets. To make sure that runoff would not destroy the grading,

Cooch placed rows of hay bales across the waterway at 100-foot intervals to slow the flow of water.

"The very next day, a freak storm dumped an inch of rain on the field, followed by another inch of rain the second day. Even the hay bales washed away.

"We redid the job," Nash recalled, "but this time we added temporary diversion ditches along the edges of the waterway. We also seeded the waterway with a nurse crop of fast-growing rye mixed with Kentucky 31 fescue and tied it down with jute netting. Now the waterway looks like a winding fairway."

Cooch is an active member of Delaware Wildlands, a group dedicated to preserving and developing land for wildlife, and he incorporated wildlife development into his conservation plan.

The LTA calls for building a pond in the corner of a pasture by the woods and for converting nearly 8 acres to trees. To encourage more wood ducks to nest at Cooch's Bridge, duck boxes were nailed to tree trunks from the front lawn through the woods and down to Christiana Creek. The farm also provides food and cover for rabbits, squirrels, quail, and red-tailed hawks.

Cooch said that flexibility is another thing he likes about his LTA. "Sure, we

have to meet rigid deadlines," he said, "but if the national economic climate changes, I can shift a pasture to cropland or some other paying venture.

The ASCS County Committee has to agree to any change in the plans, though."

According to local legend, Colonel Cooch buried one box of silver and one box of gold under trees on the lawn before General Cornwallis took over his home. The box of silver was found, but no one ever located the gold.

"Conservation work turned up just about everything but gold," said Nash. As a tile drain was being laid in a crop field, for example, a century-old French drain was unearthed. The early conservation measure used field stones to direct drainage water.

"The real treasure we found, however, was the chance to use the LTA to restore the farm at Cooch's Bridge," said Nash.

Mr. Leckie is public information specialist, Northeast Technical Service Center, SCS, Broomall, Pa.

Beating the Heat

A survey crew in Maine modified its equipment and worked at night to overcome a problem of heat waves distorting the line of sight.

by Doris W. Laber

Odds and ends from a hardware store plus a few extra hours on the job at night allowed a Soil Conservation Service survey team to overcome a problem with heat waves. And in the long run this ingenuity and effort helped the team to finish an assignment on Flood Insurance Studies 3 months ahead of schedule.

The U.S. Department of Housing and Urban Development had contracted with SCS in Maine for the field surveys which would be used with hydraulic and hydrologic data to determine flood insurance rates for the towns of Abbot, Guilford, Milo, Dover-Foxcroft, Sebec, and Sangerville.

Equipped with highly sophisticated engineering devices, Ray Herrington, SCS civil engineering technician, and his crew of 10 set out to survey cross sections along the Piscataquis River Valley in north-central Maine. They were to measure distances, slopes, and elevations.

Their equipment included a theodolite (a sophisticated transit), an electronic distance meter (EDM), and the usual targets, rods, and other surveying instruments.

In Maine, the theodolite-EDM equipment is commonly used for vertical and horizontal control surveys for Flood Hazard Analyses, Resource Conservation and Development measures, Public Law 566 projects, and sediment surveys in addition to Flood Insurance Studies.

Using the theodolite with the EDM has an advantage over using basic surveying equipment, according to Herrington. It provides accurate measurements with fewer setups, thus taking less time than more conventional equipment. For example, it might take 2 hours to survey 2 miles of rough terrain with basic equipment, but using the theodolite-EDM it would take 30 minutes.

Also, the theodolite used with the EDM reads to the nearest second

and can measure distances up to 2 miles to within one-thousandth of a foot. A basic transit, on the other hand, reading to the nearest minute, can read distances up to only about 500 feet.

Herrington and his crew made a good start on the survey early in the spring of 1976. As summer approached, though, heat waves rising from the pavement and open fields distorted the line of sight making readings impossible.

But that didn't stop the crew. "Theodolite readings are clear and steady on overcast or cloudy days and at night if the weather is right," Herrington explained.

To solve the problem the surveyors modified their equipment so they could work at night. They connected a wire to a 12-volt portable battery to power a 25-watt bulb. They added a household rheostat halfway along the cord to control brightness and mounted the light bulb behind the target.

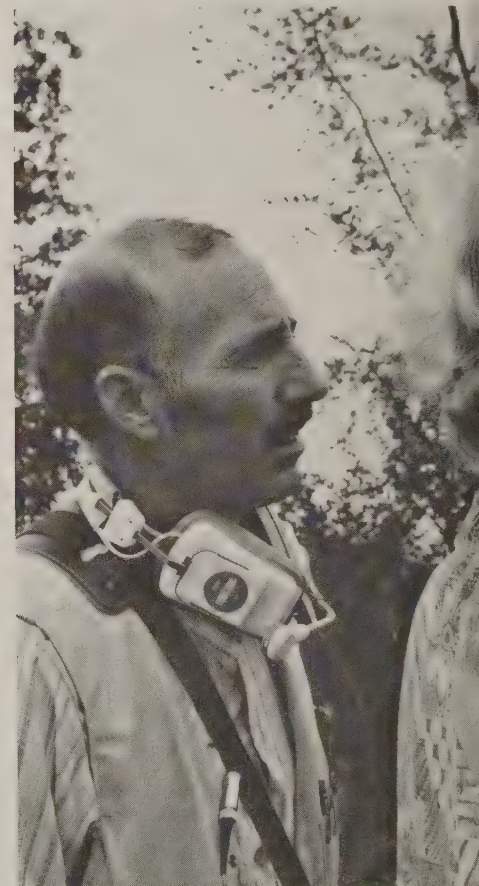
An orange-yellow cellophane filter taped across the light eliminated blurring and let enough light through so hash marks on the target could be seen and sighting edges were sharp.

A power pack of four 1.5-volt batteries connected in series and wired to bulbs in the theodolite illuminated internal verniers and crosshairs.

Thus equipped, the crew returned to survey sites after sundown. They established safety procedures including wearing reflective clothing and using emergency lights to alert motorists of their presence. The work progressed faster and with fewer interruptions than in daylight.

The total cost for adapting the theodolite-EDM to night use was less than \$20.

Ms. Laber is public information officer, SCS, Orono, Maine.



Modifications to the survey equipment include a 25-watt bulb, connected to a power pack of four 1.5-volt batteries (below left), which reflects off amber-colored material that was added to a pair of targets (below).



Civil Engineering Technician Ray Herrington (above) checks theodolite during nighttime survey. At left, Ray Herrington and Engineering Technician Parker Rand (right) adjust theodolite for daytime use.

John Pierson, 4-H delegate from East Hanover, N.J., and Kathy Robichard from Lake Charles, La., observe a pond built for wildlife on the Izaak Walton League farm.

by Shirley Foster Fields

Wildlife Conservation: A New 4-H Emphasis

How can a farmer make his land appealing to wildlife without great expenditures of effort or money? Teenage 4-H members from 27 States learned the answer to this question during the 4-H National Wildlife Conservation Workshop in Washington, D.C.

The week-long conference—held last fall as part of a new nationwide 4-H emphasis on wildlife conservation—was the first of its kind in the organization's history.

The members took part in discussions led by nationally known authorities from government and private organizations engaged in all phases of wildlife conservation. They also participated in field trips which gave them an opportunity to observe conservation problems and solutions on the land.

A highlight of the conference was a field trip to a 365-acre Montgomery County, Md., farm owned by the Bethesda-Chevy Chase Chapter of the Izaak Walton League of America. A conservation plan developed in cooperation with the Montgomery County Soil Conservation District has been used in managing the farm since 1941.

Wildlife conservation is of primary importance at the Izaak Walton acreage. The 4-H members walked over fields and woodlands and observed farm ponds and wildlife plantings that attract waterfowl, large numbers of

songbirds, and field and woodland animals.

"Not much extra work and relatively little extra money is needed to make farmlands appealing to wildlife," Soil Conservation Service Soil Conservationist Richard Brush told the group.

Brush pointed to field plantings of autumn olive, sunflowers, millet, and corn that provide the farm's wildlife with food and cover. The members also observed woodland plantings of hickory, oak, and black walnut trees.

Wood ducks, turtles, frogs, and green heron thrive at the League's two farm ponds. In the fields and woodlands, wildlife enthusiasts find rabbits, squirrels, field mice, doves, pheasants, and quail. Songbirds abound as do deer and raccoons.

Other excursions by the members included visits to the Remington Farm in Chestertown, Md., and the National Zoo in Washington, D.C. At National 4-H Headquarters in Washington, representatives from USDA's Forest Service, Environmental Protection Agency, Bureau of Land Management, Sierra Club, and National Wildlife Federation addressed the group on wildlife habitat management.

An all-day session on land-use planning featured talks by representatives from the Senate Energy and Natural Resources Committee; Office of

Coastal Zone Management; Office of Comprehensive Planning, Fairfax County, Va.; and the U.S. Fish and Wildlife Service.

M. Rupert Cutler, Assistant Secretary of Agriculture for Conservation, Research, and Education, spoke to the delegates, pointing out that farmers and ranchers in 3,000 local conservation districts throughout the Nation are installing conservation practices and establishing land-use patterns that enhance wildlife cover.

"Through these local conservation districts, USDA agencies help people with wildlife and resource management," Cutler said. Among the practices that help wildlife are terraces; contour farming; stripcropping; grassed waterways; windbreaks; crop rotation; improved pastures, range-land and woodland; and tree planting, Cutler noted.

Not only do these conservation practices improve wildlife habitat on the land, Cutler said, they also control soil erosion and reduce sedimentation. This means less movement of fertilizers and chemicals so the habitat of fish and other aquatic life is protected.

Ms. Fields is a public information officer, Information Division, SCS, Washington, D.C.



Award Winning Future Farmers

Star Farmer of America was the title awarded Dwight Buller of Hendricks, Minn., at the 50th anniversary convention of the Future Farmers of America (FFA). Along with the title, 21-year-old FFA member Buller received a \$1,000 check.

At the convention in Kansas City in November 1977, another young Minnesotan, Michael Deming of Claremont, won the equally prestigious national FFA award—Star Agribusinessman of America. Deming also received a \$1,000 check. This is the first time that both top FFA honors went to FFA members from the same State.

Star Farmer Buller made his commitment to farming at age 12 when his father's health began to fail. By the time he was a senior in high school, young Buller was handling his family's cattle feeding operation. Just before graduation from high school, he bought the home farm on contract from his parents and that year farmed 500 acres of rented and owned land.

At age 18, he borrowed money to buy equipment and supplies and contracted with neighbors to do custom fieldwork. Increases in the size of his operation since 1975 resulted in his farming 1,600 acres and doing custom fieldwork on an additional 1,200 acres last year.

In selecting the Star Farmer, judges base their decisions on candidates' management practices, return on investment, and overall knowledge and use of good farm business methods as well as leadership in FFA.

Star Agribusinessman Deming, age 21, owns and operates a materials handling dealership in Owatonna. He got an early start when his former employer was incapacitated by a serious back injury in 1974 and sold the dealership to the then 18-year-old Deming.

With backing from his father and a bank loan, Deming has broadened his operations to provide a variety of equipment services for farmers. His wife, a partner in the business, relays

In national competition, Minnesota youths win double honors for good farm business methods and community leadership.

FFA top awards went to Dwight Buller (left) as Star Farmer of America, and Michael Deming (right), Star Agribusinessman of America. James Bode (center), National FFA president, made the presentations.



calls over the citizen's band radio to keep Deming in touch with customers and his work crews in the three-county area he covers.

In his letters of congratulations to Buller and Deming, Agriculture Secretary Bob Bergland complimented the young men on their industry, initiative, and skill and stated, "I admire the leadership you have demonstrated in school and community activities."

Buller and Deming competed with other regional winners for top FFA honors. Star Farmer regional winners included Dirk Webb, Elk City, Okla.; Earl Hamilton, Springboro, Pa.; and Ronald Jones, Brighton, Tenn. Competing for the Star Agribusinessman award were Anthony Thomason, Toccoa, Ga.; Brian Duffy, Green Springs, Ohio; and Gary D. Roberson, Olympia, Wash.

FFA is a national organization of students of vocational agriculture in public secondary schools. It has more than a half million members in chapters in the United States, Guam, Puerto Rico, and the Virgin Islands. More than 22,000 students and their vocational agriculture instructors attended the 50th anniversary convention in Kansas City.

Among other national awards presented at the FFA convention, an important one was the proficiency award

in soil and water management. The winner of the \$500 award was Michael Estock of Louisville, Ohio. Estock's parents were not farmers, so he gained his experience and skill by working throughout his high school career for a farm owner.

With help from the local Soil Conservation Service office, Estock developed and implemented a farm conservation plan under which he installed such practices as crop rotation, plowing and cultivating on the contour, minimum tillage, tiling, windbreaks, and grassed waterways. He also built and maintained two farm ponds and constructed drop inlet boxes of concrete.

Estock plans to earn a degree at Ohio State University and become a farm manager. "Regardless of how good you are at farming," he said, "without proper management of soil and water, your land and its resources will be lost or laid waste by poor management."

Regional winners against whom Estock competed were James Beers, Putnam, Okla.; Paul Main, Six Lakes, Mich.; and Roger Johnson, Perkins, Ga.

New Publications

Land Use: Tough Choices in Today's World

by the Soil Conservation Society of America

The proceedings of the 1977 national symposium on land use are presented in this 454-page publication. The 53 papers were given at the symposium by planners; natural resource specialists; attorneys; Federal, State, and local government officials; landowners; and others.

The papers are grouped into seven sections. The first section, Facing the Tough Choices, contains articles such as "National Land Use Planning: A Legislative Agenda" and "Programs to Help People Make Land Use Choices." The second section, Competition for Land, has papers about the demand for food and fiber, for living space, and for natural space.

Section 3, Land for Food and Fiber, addresses the agricultural issues involved with land use planning. Several papers in this section deal with specific approaches in various States such as New York, California, New Jersey, and Iowa.

The next three sections are about providing land for living space, setting aside land for natural space, and Federal and State involvement in land use planning.

Finally, a special section is included on the role of planners and developers, citizens, elected officials, farmers, attorneys, landowners, and the courts.

The book is available from the Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. Single copies are \$7; 10 or more copies are \$6 each. (Order Special Publication No. 22.)

National Forest Landscape Management Volume 2, Chapter 3, Range

by USDA's Forest Service

Fourth in a series of publications about visual resources, this chapter provides landscape management guidelines as applied to range vegetation control and range structures.

The section on objectives introduces the publication with the statement that "the *visual landscape* is now considered a basic resource, to be 'treated as an essential part of and receive equal consideration with the other basic resources of the land.' " As an aid to understanding why range management is necessary, the publication then recounts the historical impact of the invasion of brush on U.S. grazing land. It continues with three basic concepts to be considered in evaluating the visual impact of range management practices: characteristic landscape, variety, and deviations.

These concepts are followed by a section on dominance elements. Each of the four elements—form, line, color, and texture—is shown in color photographs.

The publication also has sections on the collection and use of basic planning data and on design guidelines which include considering wildlife requirements and the impact of access roads.

The section on vegetative control measures presents three methods for removing undesirable vegetation: mechanical treatment, chemical treatment, and prescribed burning. The final section is on range structures which are discussed in three categories: fences, corrals and related structures, and water developments.

The publication is illustrated with full-color photographs and art. A list of selected references is given along with the other publications in the series on National Forest Landscape Management.

The publication is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Single copies are \$1.70 and a 25 percent discount is given on orders of 100 or more copies. (Agricultural Handbook No. 484, Stock No. 001-000-03578-9.)

Conservation Tillage for Wheat in the Great Plains

by the U.S. Department of Agriculture, Cooperative Extension Service

This 32-page publication covers the need for conservation tillage, the planting of wheat, and the control of erosion, weeds, diseases, and insects. It is aimed at helping farmers produce wheat and save water, soil, and energy at the same time.

Minimum tillage, no-till, and chemical fallow are some of the terms defined in a brief glossary at the front of the publication. Illustrations include photos, tables, and maps. There are two lists of references: papers prepared specifically for the publication and general references.

"Conservation Tillage for Wheat in the Great Plains" was prepared in cooperation with the Wheat Industry Resource Committee and the National Association of Wheat Growers.

PA-1190 is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Copies are \$1.30 each. There is a 25 percent discount on orders of 100 or more copies.

Conservation Plants for the Northeast

by the Soil Conservation Service

This booklet describes plants suited to specific conservation uses under different site conditions in the northeastern United States.

The plants are grouped according to their main conservation use into five categories: plants for disturbed areas; ornamental ground covers; plants for coastal dunes and sandy inland areas; wildlife food and cover plants; and plants for screens, hedges, and windbreaks.

Sixty plants are included along with information on areas of climatic adaptation, conservation uses, growth rate, and site conditions under which the plants can grow. The booklet also has a section on how to establish plants.

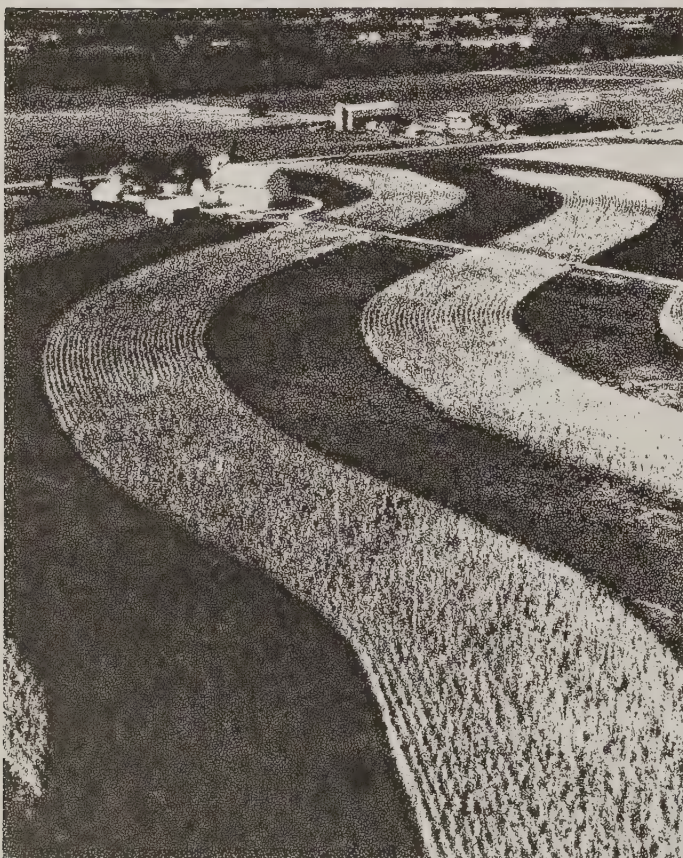
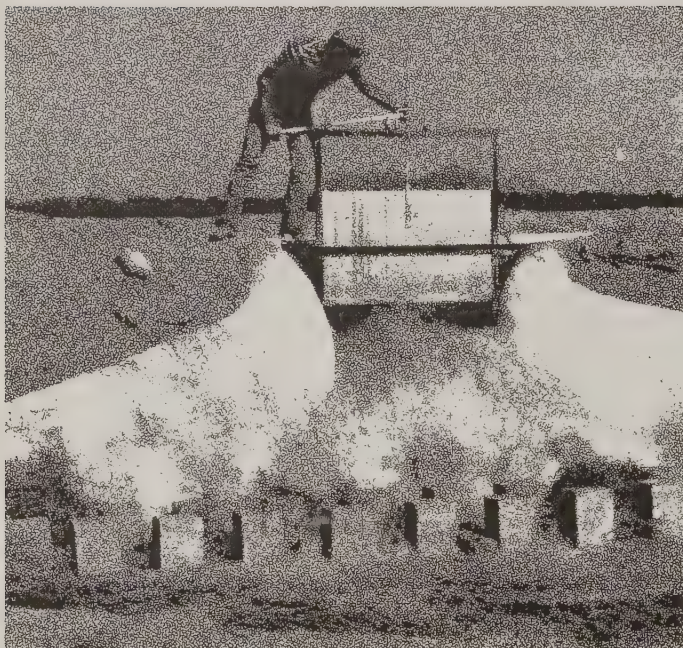
The full-color publication is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Single copies are \$1.70. (Stock No. 001-000-03605-0.)

1977

Conservation Highlights



Summary of Activities of the Soil Conservation Service for Fiscal Year 1977



Drought, rising farm expenses—including energy costs—and other factors in 1977 renewed farmer and rancher interest in soil and water conservation.

During fiscal year 1977, 73,000 farmers and ranchers signed cooperative agreements on more than 28 million acres.

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) helped them use minimum tillage, for example, on 3.9 million more acres of cropland in fiscal year 1977. The practice conserves soil moisture and saves fuel by reducing the number of tillage trips across the field. It also reduces soil erosion by as much as 95 percent.

Use of stripcropping and field windbreaks also increased during the year, reversing about a 5-year downward trend. Cooperators stripcropped more than 455,000 acres and planted more than 2,900 miles of field windbreaks.

To make the best use of available water and to protect the soil, district cooperators installed 14,474 irrigation systems on almost 1.5 million acres.

With the increasing awareness of forestry values, land users sought SCS assistance in planting nearly 380,000 acres of trees.

SCS technicians helped prepare more than 56,000 conservation plans covering almost 24 million acres in fiscal year 1977. They also provided onsite assistance to farmers, ranchers, and other land users to make sure that conservation practices were properly designed, installed, and maintained. SCS provided more than 2.7 million technical services. SCS also helped some 934,000 individual landowners and groups of land users—such as neighboring landowners or community organizations—with conservation plans and related services.

Adequately treated land, or land on which conservation practices were planned and applied during 1977 with SCS assistance, totals 39,827,560 acres.

Conservation Help for Units of Government

SCS employees furnished more than 106,000 services to 25,576 local and State governments during the year. SCS provided basic soil and water data used by local governments in preparing regulations concerning land use and control of sediment and erosion. SCS also helped prepare more than 14,000 natural resource inventories and evaluations. Local governments use these to develop quality standards for conservation land use and treatment.

Soil Surveys

SCS leads the National Cooperative Soil Survey. As of September 30, 1977, more than 1.4 billion acres in the United States, Puerto Rico, and the Virgin Islands had been mapped to show the location and kind of soil. More than 57 million acres were mapped during fiscal year 1977.

A record 110 soil survey manuscripts and maps were submitted for printing during the year, and 91 surveys were published. At the end of the year, SCS had 1,067 modern published soil surveys covering 515 million acres.

Snow Surveys

In the West, SCS snow surveyors measure the mountain snowpack in winter to estimate how much water will be available for many uses in spring and summer. In fiscal year 1977, snow surveyors took nearly 20,000 measurements of snow, precipitation, temperature, and soil moisture and issued 3,533 water supply forecasts.

Progress in automation continued during the year. Remote sensing equipment was installed at 100 data sites, making a total of 360 automated sites. The meteor burst communications system contractor installed communication equipment at 160 sites and is expected to begin final testing of the system early in 1978.

Emergency Assistance

Under Section 216 of the Flood Control Act of 1950, more than \$12 million was obligated for emergency streambank stabilization, debris removal, and revegetation to protect life and property after storms and floods caused damage in 13 States.

SCS provided technical assistance to farmers, ranchers, and local governments in 2,108 counties designated as emergency drought areas in 36 States, Puerto Rico, and the Virgin Islands.

Small Watershed Projects

Small watershed projects under Public Law 566 combine conservation measures on private and public lands with dams and other structural measures to reduce floods and provide water supply, recreation, and wildlife habitat. During fiscal year 1977, 24 small watershed projects were completed, bringing to 450 the number completed since the program began in 1954.

River Basin Studies

Through the River Basin Program, SCS has USDA leadership for water and related land resource planning assistance to Federal, State, and local governments. SCS also leads USDA participation in Water Resources Council interagency studies.

Colorado River Basin Salinity Control Program

Under Public Law 93-320, SCS is cooperating with the Bureau of Reclamation of the U.S. Department of the Interior to reduce salt concentrations in the Colorado River, primarily by improving onfarm irrigation efficiency. Under the Title I program, the major practices installed include land leveling, concrete-lined irrigation ditches, and structures for water control and measurement. Title II salinity control studies were going on in five areas covering some 540,000 acres of irrigated land and thousands of dryland acres.

Environmental Services

SCS filed 17 draft and 10 final environmental impact statements with the Council on Environmental Quality during fiscal year 1977. The agency also commented on 761 environmental impact statements from other agencies and cooperated in numerous environmental assessments throughout the Nation.

Flood Plain Management

SCS completed 69 flood hazard studies in 28 States during fiscal year 1977. Through the studies, SCS provides information on managing flood plains to local governments and provides information needed by the U.S. Department of Housing and Urban Development in determining flood insurance rates.

National Water Assessment

SCS continued to participate in the Water Resources Council's second national water assessment. SCS provided data on existing use and projected water needs for livestock, irrigation, and self-supplied domestic water systems for the years 1985 and 2000. SCS also supplied data on existing and projected upstream flood damages and cropland erosion rates.

Wildlife

SCS specialists helped landowners improve 13.2 million acres of land and water for wildlife during the year. They helped landowners convert more than 336,000 acres from other uses to wildlife and recreation areas. Other conservation measures, including the 45,000 ponds SCS designed during the year, also benefit wildlife.

SCS helped landowners involved in aquaculture by providing technical assistance on 4,400 acres of commercial fish ponds.

Water Bank Program

Through the Water Bank Program, SCS provides technical assistance for conserving wetlands in migratory waterfowl nesting and breeding areas. During fiscal year 1977, SCS assisted land users in preparing 758 conservation plans that support Water Bank agreements. A total of 4,202 plans covering 430,112 acres have been developed or revised for Water Bank agreements since the program was established in 1972.

Recreation

SCS provided technical and financial assistance for establishing or expanding 686 public recreation developments, which included parks run by State, county, and local governments. SCS specialists also provided technical assistance to more than 12,000 private landowners in developing commercial and noncommercial recreation facilities.

Plant Materials

Seven new conservation plant varieties were released in fiscal year 1977 by SCS and other agencies. Among the released varieties were plants for use in reclaiming surface-mined land in the West, converting marginal cropland to grass, and improving rangeland and pastureland. Three of the released plants—'Zorro' annual fescue, 'Corto' Australian saltbush, and 'Kalo' dwarf English trefoil—help protect critically eroding areas. More than 130 kinds of improved plants selected or developed by SCS are now produced commercially. Commercial production of the plants during fiscal year 1977 included over 13 million pounds of seed, 8 million seedlings, and millions of vegetative cuttings and shoots for transplanting.

Woodlands and Windbreaks

With SCS technical assistance, landowners planted nearly 380,000 acres of trees, more than 23,000 acres of farmstead and feedlot windbreaks, and more than 2,900 miles of field windbreaks. They also renovated 27,177 acres of existing windbreaks. Landowners prepared 222,415 acres for planting or seeding forest crops. Improved harvesting was practiced on 952,000 more acres in fiscal year 1977, for a total of almost 39 million acres nationwide.

Pasture and Range Conservation

SCS helped farmers and ranchers with pasture and hayland plantings on almost 1.9 million acres during the year. They also helped ranchers reseed more than 344,000 acres of range, for a cumulative total of 17.4 million acres.

SCS professionals assisted ranchers with 2.5 million acres of brush management. An increasing number of ranchers are using patterns of brush management that benefit livestock and provide food and cover for wildlife. SCS also helped ranchers develop planned grazing systems for 7.8 million acres, bringing the total acreage under the system to almost 77 million.

Great Plains Conservation Program

During the year, 1,904 farmers and ranchers signed long-term contracts to apply permanent conservation measures on 4.5 million acres. Since the program began in 1956, more than 54,000 farmers and ranchers have signed Great Plains Conservation Program contracts covering 99 million acres.

Resource Conservation and Development Areas

Through Resource Conservation and Development (RC&D) areas, SCS provides technical and financial help to local units of government for improving land and water resources. RC&D areas are sponsored by conservation districts, county and town governments, and local and State agencies. The program goal is to improve the economy, environment, and living standards in RC&D areas.

During fiscal year 1977, 10 new RC&D areas in 10 States were authorized for assistance, bringing the total number of RC&D areas to 178. The program involves 1,196 counties in all States except Alaska.

Agricultural Conservation Program

SCS assisted farmers and ranchers in preparing 540 conservation plans that serve as foundations for long-term Agricultural Conservation Program (ACP) agreements. The agreements, which run as long as 10 years, provide cost sharing on selected conservation practices. This year's plans cover 696,266 acres, bringing the cumulative total to 4.9 million acres. SCS serviced 187,909 ACP referrals in fiscal year 1977.





Reportable progress in soil and water conservation programs assisted by the Soil Conservation Service

Metric Conversions

To assist readers, information in the tables is given in metric and in units of common measure. A hectare is equal to 2.471 acres; a kilometer is equal to 0.6214 mile.

Summary of Progress Fiscal Year 1977

Progress Item	Fiscal Year 1977	Cumulative to Sept. 30, 1977
Conservation Plans and Related Services		
District cooperators	No. 72,910 acres 28,093,543 hectares 11,369,457	2,207,700 780,672,604 315,938,203
Services to land users	No. 2,710,443	—
Individuals and groups assisted	No. 934,005	—
Individuals and groups applying practices	No. 458,476	—
Conservation plans	No. 56,415 acres 23,944,780 hectares 9,690,452	1,758,701 608,465,374 246,245,937
Conservation plans revised	No. 23,995 acres 17,631,991 hectares 7,135,667	— — —
Inventories and evaluations	No. 90,445	—
Federal land units in coordinated conservation plans	No. 102	1,309
Federal lands in coordinated conservation plans	acres 756,495 hectares 306,154	14,632,049 5,921,590
Conservation Help for Units of Government		
Technical services for area planning	No. 106,359	—
Land use and treatment site plan reviews	No. 20,746	—
Agencies assisted	No. 25,576	—
Resource plans	No. 647	—
Inventories and evaluations	No. 14,418	—
Snow Surveys and Water Supply Forecasting		
Hydrometeorological measurements	No. 19,435	—
Snow survey and water supply forecasts	No. 3,533	—
Resource Surveys		
Resource studies	No. 2,701	2,703
Resource reports	No. 443	443
Great Plains Contracts		
Applications received	No. 2,610 acres 6,696,455 hectares 2,710,055	58,866 113,610,613 45,978,215
Contracts signed	No. 1,904 acres 4,495,828 hectares 1,819,462	54,140 99,413,881 40,232,798
Contracts terminated	No. 235 acres 307,236 hectares 124,338	3,333 3,786,445 1,532,374

Progress Item	Fiscal Year 1977	Cumulative to Sept. 30, 1977
Contracts completed	No. 2,493 acres 3,902,146 hectares 1,579,198	36,901 65,579,632 26,540,077
Unserviced applications on hand	No. 4,726	—
Agricultural Conservation Program		
ACP referrals serviced	No. 187,909	—
Conservation plans for long-term ACP agreements	No. 540 acres 696,266 hectares 281,779	8,631 4,878,352 1,974,269
Soil Surveys		
Soil surveys	acres 57,529,907 hectares 23,282,353	1,403,049,106 567,813,973
Recreation Developments Established		
Private	No. 12,367	429,396
Public	No. 686	73,748
Public Law-566 Watershed Projects		
Applications	No. 12	2,846
Authorized for planning	No. 33	1,769
Approved for construction	No. 2	1,186
Construction starts	No. 16	961
Projects completed	No. 24	450
River Basin Studies		
Initiated	No. 16	145
Completed	No. 11	83
Flood Hazard Studies		
Flood hazard analyses	No. 33	121
Flood insurance studies	No. 36	191
Colorado River Basin Salinity Control Program		
Applications received	No. 48	169
Contracts signed	No. 34 acres 4,827 hectares 1,953	64 9,730 3,938
Contracts—structural measures completed	No. 20 acres 3,374 hectares 1,365	31 4,933 1,996
Resource Conservation and Development Areas		
Applications on hand	No. — acres — hectares —	62 268,576,000 108,692,707
Areas authorized for assistance	No. 10 acres — hectares —	178 754,480,000 305,338,056

Progress Item		Fiscal Year 1977	Cumulative to Sept. 30, 1977
RC&D area plans accepted	No.	—	158
	acres	—	668,592,000
	hectares	—	270,579,182

RC&D measures completed	No.	1,862	12,075
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Water Bank Program

Contracts developed	No.	758	4,202
	acres	111,342	430,112
	hectares	45,060	174,066

Practice		Fiscal Year 1977	On the land— Sept. 30, 1977
Agricultural waste management systems	No.	2,075	20,566
Brush management	acres	2,581,714	59,047,738
	hectares	1,044,819	23,896,620
Critical area planting	acres	133,003	5,748,767
	hectares	53,826	2,326,526
Farmstead and feedlot windbreaks	acres	23,601	829,238
	hectares	9,551	335,593
Field windbreaks	miles	2,945	108,470
	kilometers	4,740	174,566
Fishponds, commercial	acres	4,442	114,327
	hectares	1,798	46,268
Fishpond management	No.	37,923	821,022
Grassed waterways or outlets	acres	75,833	2,267,996
	hectares	30,689	917,858
Irrigation systems	No.	14,474	376,862
	acres	1,423,228	38,153,250
	hectares	575,980	15,440,620
Irrigation water conveyances	miles	8,554	262,016
	kilometers	13,776	421,675
Irrigation water management	acres	2,462,930	26,605,090
	hectares	996,748	10,767,080
Minimum tillage	acres	3,856,308	47,456,720
	hectares	1,560,647	19,205,735
Pasture and hayland plantings	acres	1,886,806	74,854,948
	hectares	763,590	30,293,797
Planned grazing systems	acres	7,762,655	76,542,551
	hectares	3,141,546	30,976,770
Ponds	No.	45,147	2,186,934
Proper woodland grazing	acres	1,452,831	21,240,308
	hectares	587,961	8,595,953
Range seeding	acres	344,484	17,391,454
	hectares	139,413	7,038,321

Practice		Fiscal Year 1977	On the land— Sept. 30, 1977
Reclamation of surface- mined land	acres	33,663	11,894,988
	hectares	13,623	1,766,902
Stripcropping	acres	456,643	22,184,159
	hectares	184,803	8,977,929
Subsurface drainage	miles	28,774	1,053,816
	kilometers	46,308	1,695,953
Surface drainage	miles	7,532	393,502
	kilometers	12,122	633,280
Terraces	miles	20,927	1,251,184
	kilometers	33,678	2,013,586
Tree planting	acres	379,570	25,059,625
	hectares	153,612	10,141,630
Wildlife upland habitat management	acres	12,571,704	111,066,407
	hectares	5,087,768	44,948,575

Wildlife wetland habitat management	acres	610,497	10,022,077
	hectares	247,068	4,055,935
Windbreak renovation	acres	27,177	143,339
	hectares	10,999	58,009
Woodland, improved harvesting	acres	952,002	38,645,951
	hectares	385,275	15,640,016
Woodland improvement	acres	298,852	19,141,737
	hectares	120,945	7,746,661
Woodland site preparation	acres	222,415	7,941,759
	hectares	90,011	3,214,030

Land Treated for Erosion

Land adequately treated	acres	39,827,560	—
	hectares	16,118,212	—

Land Use Conversions		SCS-assisted conversions Fiscal Year 1977	Estimate of all conversions Fiscal Year 1977
Cropland to grassland	acres	547,082	8,948,592
	hectares	221,404	3,621,495
Cropland to woodland	acres	50,152	918,458
	hectares	20,297	371,700
Cropland to other uses	acres	88,956	3,026,695
	hectares	36,000	1,224,903
Grassland to cropland	acres	590,786	4,875,777
	hectares	239,091	1,973,227
Any use to wildlife- recreation land	acres	336,228	3,731,389
	hectares	136,071	1,510,093
Woodland to cropland	acres	117,280	819,781
	hectares	47,463	331,765
Woodland to other uses	acres	73,091	1,134,731
	hectares	29,580	459,226

¹ From an SCS inventory, *Status of Land Disturbed by Surface Mining in the United States as of July 1, 1977.*

Reviews

Farm Machinery and Equipment

Harris Pearson Smith and Lambert Henry Wilkes. 1976. Sixth edition. McGraw-Hill Book Company, New York. 488 pp., illus. \$18.50.

This publication is designed for use in the classroom and as a reference book on farm equipment and machinery.

It describes equipment for applying insecticides, herbicides, and fungicides; equipment for harvesting cotton, corn, small grains, and other crops; and crop-processing and labor-saving equipment.

Chapters on lubricants and lubrication, rubber tires for farm equipment, transmission of power, selection of farm machinery, the economics and management of farm equipment, and other informative chapters make it a useful guide to the use and maintenance of modern farm machinery.

Many black and white photos, line drawings, diagrams, tables, and charts illustrate the text. A list of references and a list of questions and problems that can be used for class discussions or assignments follow each chapter.

The authors also provide an appendix with tables that give: equivalents for acres, bushels, meters, watts, etc.; the multiplication factor for converting acres to hectares, square feet to square meters, etc.; draft and power requirements of crop machines; historical dates in the development of farm equipment in the United States; the miles per hour for different tire sizes; the distance traveled in tilling an acre of land with various widths of cut; the multiplication factor for converting pounds per row to pounds per acre; and other information.

"Farm Machinery and Equipment" is comprehensive and up-to-date. It would be especially helpful to agricultural students and those entering careers in agriculture.

—Gerald M. Darby, staff agronomist, SCS, Washington, D.C.

Meetings:

March

- 12-16 American Concrete Pipe Association, Atlanta, Ga.
- 17-19 National Wildlife Federation, Phoenix, Ariz.
- 19-22 North American Wildlife and Natural Resources, Phoenix, Ariz.
- 22-23 Air Pollution Control Association Government Affairs Seminar, Washington, D.C.

April

- 4-6 Garden Club of America, Birmingham, Ala.
- 5-7 Engineering Geology and Soils Engineering Symposium, Boise, Idaho
- 9-11 American Pulpwood Association, Atlanta, Ga.
- 9-12 Association of American Geographers, New Orleans, La.
- 17-21 American Geophysical Union, Washington, D.C.
- 19-21 Air Pollution Control Association, Conference on Methodology for the Assessment of Air Pollution Effects on Vegetation, Minneapolis, Minn.
- 19-21 Hardwood Plywood Manufacturers Association, Panama City, Fla.
- 24-26 National Academy of Sciences, Washington, D.C.
- 29-May 4 American Society of Planning Officials, Indianapolis, Ind.
- 30-May 2 Chamber of Commerce of the United States, Washington, D.C.

May

- 1-5 League of Women Voters, Cincinnati, Ohio
- 6-7 Sierra Club, San Francisco, Calif.
- 6-9 National Forest Products Association, Washington, D.C.
- 17-19 Boy Scouts of America, Phoenix, Ariz.

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Soil Conservation

April 1978

U.S. Department of Agriculture

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Conservation in a Hurry

From the Administrator

When flood, forest fire, hurricane, or other havoc strikes, many public and private organizations move quickly to set up shelters, rescue survivors, and locate victims. They help people begin cleaning up, filling out insurance forms, and getting their lives and businesses back on course. These are the familiar stories of disasters and disaster relief we see on television and read about in newspapers.

Many natural disasters do another, less publicized, kind of damage. They destroy much of a watershed's natural protection against excessive runoff and erosion, leaving the stricken area more vulnerable than ever to landslides, floods, and contaminated water supplies. Cleanup and rebuilding efforts may themselves be threatened.

Reducing hazards created by sudden disasters is the role of the Soil Conservation Service under Section 216 of the Flood Control Act of 1950. Since 1960, more than \$120 million has been used for watershed repair work after disasters, including forest fires; Hurricanes Camille, Agnes, and Eloise; failure of the Teton Dam; and the most recent Johnstown flood.

On request, SCS provides emergency assistance to slow down runoff, reduce soil erosion and sedimentation, prevent failure of weakened structures and contamination of water, and restore waterway capacity.

To protect damaged watersheds from further harm, SCS relies on simple but proven measures:

- Seeding, fertilizing, mulching, and fencing to establish a quick cover of vegetation on eroding areas;
- Installing debris basins and sediment traps;
- Reshaping, revegetating, and riprapping to stabilize streambanks and channels that have been left raw and crumbling;
- Opening stream channels that have been blocked by debris and sediment;
- Maintaining fire lanes and important roadways in forested areas.

These actions, familiar to professional soil conservationists, are the same conservation practices that protect soil and water resources on many farms and ranches and in urban areas. When disaster wipes out Nature's own defenses against runoff, erosion, and sedimentation, these conservation practices become an urgent necessity to safeguard lives and property.

Mel Davis

Soil Conservation is the official magazine of the Soil Conservation Service. The Secretary of Agriculture has determined that publication of this periodical is necessary in the transaction of public business required by law of the Department. Use of funds for printing *Soil Conservation* has been approved by the Director of the Office of Management and Budget through July 31, 1978.

Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Soil Conservation Service
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Cover:

SCS provided flood-stricken Johnstown, Pa., with emergency assistance. See article on pages 4 and 5. (Photos, Johnstown Tribune-Democrat.)

Soil Conservation

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Johnstown: Underwater Again

Last summer, Johnstown, Pa., was hit by its third devastating flood in less than 100 years. SCS provided emergency assistance in the flood-stricken area.

by Graham T. Munkittrick



The water supply reservoir at Tanneryville, just north of Johnstown, broke and sent a 12-foot-high wall of water through the valley crushing houses into kindling.
—courtesy, Johnstown Tribune-Democrat.



SCS Civil Engineer Jon Lantman (left) from the Somerset Area Office works on construction specifications with John Robb, river basin leader, and Walter Bolles (right), civil engineer, from the SCS State office in Harrisburg.

It was a night of terror for Johnstown. The rain started falling late on July 19, 1977. In the next few hours, 13 inches fell, turning streams into torrents in an eight-county area of Pennsylvania.

At Tanneryville, just north of Johnstown, the water supply reservoir broke at 4 a.m. on July 20, sending 100 million gallons of water cascading into the already flooded valley. A 12-foot-high wall of water, moving at an estimated 60 miles an hour, crushed houses into kindling.

Floodwaters devastated sections of rural areas, villages, and cities. More than 75 persons were reported dead or missing.

A steel beam from a demolished building was found bent like a horseshoe. According to steel company engineers, it would have taken a force of more than 30,000 pounds per square inch to bend the beam.

Along Solomon Run, which passes through several boroughs and the city of Johnstown, floodwaters spilled over a 20-foot-wide concrete-lined channel and cut a path through the city four blocks wide. The water ripped out streets and sidewalks; water, sewer, and gas lines; homes and businesses; and a four-story apartment building.

The flood filled many stream channels with debris and scoured streambanks. It even relocated some streams.

In Laurel Run, much of the streambed was gone. About 2 miles of the valley floor lost an average of 4 feet of soil.

On August 11, the Federal Disaster Assistance Administration (FDAA)

gave the Soil Conservation Service (SCS) the assignment to restore streams in the Johnstown area to their preflood condition.

In emergency situations, under Section 216 of Public Law 81-516, SCS has authority to stabilize streambanks and clear debris from channels to safeguard lives and property from further flooding and erosion.

Because Section 216 funds in the amount needed were not readily available, FDAA advanced SCS the money to start Section 216 work right away.

The SCS State office in Harrisburg, Pa., coordinated the effort, and the SCS Somerset area office was used as the operations center. Area Conservationist James Gettinger was put in charge of the emergency assistance work.

An engineering and contracting section was set up at the operations center for the 13 SCS engineering teams that were sent into the eight-county area.

In Johnstown, SCS people moved into the office of the Federal Coordinating Officer—who is appointed by the President—to help him coordinate emergency assistance work with the other disaster agencies. SCS people also helped keep communication open with lawmakers, officials of municipalities and other units of government, and the public.

In the first week after taking the Johnstown assignment, SCS awarded 13 contracts for removing debris from stream channels and stabilizing streambanks by riprapping, seeding, or regrading.

In the first month, more than \$6

million of stream restoration work was planned, contracted, or completed.

The flood also had relocated a channel of the South Fork of the Conemaugh River onto a section of railroad tracks that run between the towns of South Fork and Lloydell. The original channel was choked with rock and rubble and needed to be cleared to restore the water flow capacity.

On August 18, SCS was assigned immediate restoration of the South Fork channel.

The next day, an SCS engineering team determined the amount of debris that had to be removed and wrote specifications for the size and type of equipment that would be needed. The team also determined the methods of stream restoration that would cause the least damage to the environment.

By late that night, bid invitations were completed, legal notices delivered, and a 5-day bid period began. Construction on the South Fork was completed in 45 days.

In the Johnstown area, SCS assisted with a total of 275,000 tons of riprapping, 395 acres of seeding, and 62 miles of clearing streams of debris.

The Johnstown flood of 1977 was a cruel disaster. Nothing could change that. But SCS helped protect the area from further sedimentation and erosion along damaged streams.

Mr. Munkittrick is State conservationist, SCS, Harrisburg, Pa.



SCS emergency assistance work in the Johnstown area included removing debris from Little Paint Creek.

A water quality study on four farms in Colorado gives best management practices for controlling pollution from salt, nitrates, and sediment.

Improved Irrigation: Key to Water Quality in Colorado

As part of the water quality study, a weir is used to measure water flow (below) and a soil moisture extraction tube is used to test salt buildup in the soil profile (right).



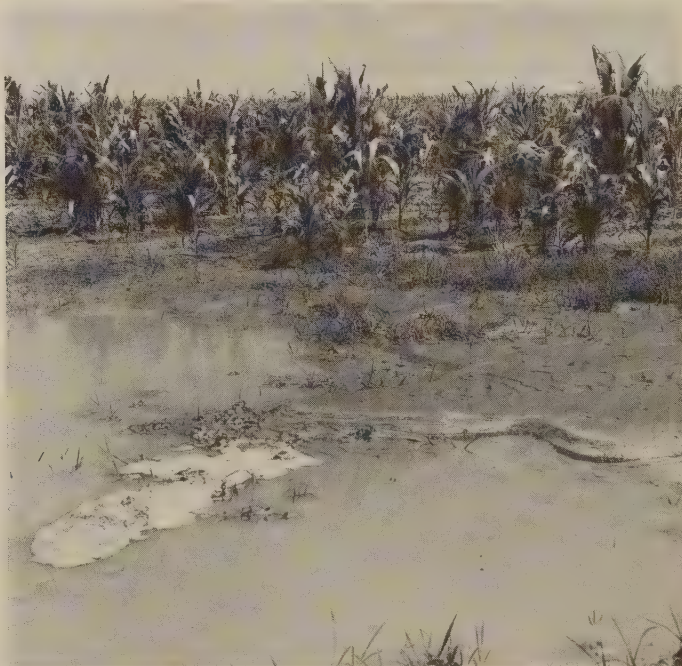
Preliminary results from water quality studies on four irrigated farms in northern Colorado indicate alfalfa buffer strips, improved irrigation systems, and improved irrigation water management will be the most effective best management practices.

The studies were completed in summer 1977 by the Toups Corporation, a Colorado engineering firm. They were conducted as part of the Larimer-Weld Council of Governments' water quality study, under Section 208 of the Federal Water Pollution Control Act Amendments of 1972. Working under an Intergovernmental Personnel Act agreement with the Council of Governments, Kent Ververs, formerly Soil Conservation Service district conservationist at Greeley, assisted Toups with the studies.

The principal pollutants discharged by irrigated agriculture in the Larimer-Weld region are salt, nitrates, and sediment. Ververs assisted in conducting studies of these pollutants on four grain and livestock farms in Larimer and Weld Counties.

"Irrigated agriculture is the cornerstone of our economy. Over 500,000 acres are irrigated in the two counties and the value of crops is \$175 million annually," said Ververs. Beef and lamb feeding operations add substantially to this figure. The two-county area leads the Nation in numbers of beef cattle and lambs fattened annually.

Water quality problems on the farms studied are typical of the problems faced by irrigators in the region. Studies were not made on dryland farms because of time limits



A sediment pond on one of the four farms studied is used to measure erosion from irrigated cornfield.

and the conclusion that the most significant water quality problems in the Larimer-Weld area stem from irrigated lands.

Two of the farms studied have high concentrations of salt in irrigation return flows. These are caused by irrigation water flowing over shallow shale deposits and dissolving salts. Salinity levels as high as 6,000 milligrams per liter (mg/l) were measured in subsurface drains on the two farms. Over half of the subsurface drain samples exceeded 1,500 mg/l of total dissolved solids; concentrations over 1,500 mg/l will reduce crop yields.

Irrigation return flows were found to increase salinity from approximately 50 mg/l as the major tributaries leave the mountains to as much as 1,500 mg/l at the confluence of the South Platte River. Salinity levels of the South Platte increase from approximately 700 to 1,200 mg/l as it flows through the Larimer-Weld region.

"As a result of the salinity study, the Toups Corporation found that salt pollution could be lessened by reducing excessive seepage and subsurface return flows across shallow lying shales," explained Ververs. "Lining canals and ditches with concrete, using shorter irrigation runs, and irrigating according to crop needs and soil leaching requirements are the best management practices Toups recommends to reduce salt concentrations."

High concentrations of nitrates were found in ground waters of another farm in the study. The farmer applied manure heavily to crops grown on sandy soils, and nitrates

leached easily through the soil profile. Samples taken on the farm showed a nitrate content of 43 mg/l in irrigation well water. This converts to 100 pounds of nitrogen in the nitrate form for each acre-foot of water. If the farmer applies 2 acre-feet during the irrigation season, he would get enough nitrogen from the water alone to meet the requirements for corn.

"To reduce high nitrate concentrations, Toups recommends better manure and commercial fertilizer management and irrigation water management as best management practices," said Ververs.

"Most irrigators would benefit by reducing the length of their irrigation runs. This would allow more even distribution of water," he continued. "A long furrow run necessitates over-irrigation and leaching of the profile at the upper end of the field in order to get enough water to the lower end. A second line of gated pipe across the middle of the field would be an effective method for reducing length of runs."

Sedimentation was not a significant problem in most rivers of the region, according to Ververs. Most have flood plains which serve as buffers prohibiting direct discharges of irrigation tailwaters to the river. However, there was a noticeable increase in sediment in the Little Thompson River.

"We attribute this sedimentation to the steep slopes and fine soils in the area," said Ververs. "Also, there is considerable farming right to the river's edge.

"For the farms around this area, Toups recommends a series of alfalfa

buffer strips as an effective management practice along the river," Ververs continued. "Tailwater collection ponds with a pump back system would also catch sediment and allow the farmer to reuse irrigation runoff."

Local input by farmers and other community leaders has strongly influenced the Larimer-Weld study. The Council of Governments has a cooperative agreement with 10 soil conservation districts, SCS, the State Soil Conservation Board, a three-member executive committee, and a 100-member citizen advisory committee.

Eric Eidsness, director of 208 water quality planning for the Larimer-Weld Council of Governments, said, "It's apparent we haven't solved all the problems related to agricultural pollution. Additional studies will be necessary, as well as accelerated cost share and technical assistance."

However, the 208 study for the Larimer-Weld region of Colorado shows that conservation practices can be adapted and applied to achieve improved water quality.

Mr. Halstead is State conservationist, SCS, Denver, Colo.
Mr. Pitts is vice president, Toups Corporation, Loveland, Colo.

No-till forage seeders are making pasture and hayland renovation quick and easy while leaving a protective cover on the land.

by Phillip Bousman

No-Till Forage Renovation

A new method of renovating pasture or hayland is being tried in Greene County, Ind. Usually, farmers in the area renovate by plowing and disking the seedbed or disking the sod two or three times before reseeding. This destroys most of the soil's protective cover.

In this area of southern Indiana, forage is grown mainly on silt loam soils with rolling topography. The soils erode easily if not protected.

Because of this potential erosion problem, Leon Vandeventer, who owns a dairy farm near Bloomfield, decided to renovate one of his hayfields with a no-till forage seeder. The seeder cuts shallow grooves in the sod, drops the seed into the grooves, and presses the seed tightly into the soil, leaving the sod virtually undisturbed.

Vandeventer, a cooperator with the Greene County Soil and Water

Conservation District, is the first farmer in the area to try the new method.

"A well-balanced mixture of grass and legumes for hay is important," he said. "The legumes provide the nitrogen needed for an improved stand and give me a better quality forage."

In 1976, Vandeventer, working through the district, asked the Soil Conservation Service for assistance in planning his no-till seeding. He had seeded his hayfield 5 years before with orchardgrass and alfalfa, but nearly all the alfalfa had disappeared.

In early April 1976, using a soil test, Vandeventer determined that his soil needed lime and fertilizer. After adding the nutrients, he used the no-till seeder to seed 10 pounds of red clover per acre, in rows 10 inches apart.

Before the clover germinated, he sprayed a contact herbicide to reduce grass competition and to leave a mulch to protect the soil from erosion. The grass recuperated from the herbicide in about 5 weeks.

By early July, his forage of orchardgrass and red clover was ready to be cut.

"I've been very satisfied with no-till forage renovation," Vandeventer said. "I could sow the legume seed earlier in the spring, I saw no erosion from my hillsides, and my first hay crop was ready in only 3 months."

Mr. Bousman is district conservationist, SCS, Bloomfield, Ind.

A no-till forage seeder cuts shallow grooves in sod, drops seed into the grooves, and presses the seed into the soil. The sod is left virtually undisturbed.



by Nadine E. Pitts

New Design for No-Till Planter

A no-till planter developed by two Alabama farmers is boosting soil conservation and crop yields in several southern Coastal Plain States.

Neighbors in the early 1970's fondly called it the Harden family's "Ole Blue Goose." All who saw it agreed it was the strangest-looking planter they had ever seen.

A working model, the "Ole Blue Goose" gradually was transformed into a modern no-till planter. It helped bring about some welcome changes in farming in the southern Coastal Plain—an increase in conservation tillage and an increase in research on conservation tillage.

Brothers Jerrell and Leo Harden of Banks, Ala., cooperators with the Pike County Soil and Water Conservation District (SWCD), learned about no-till farming firsthand in 1972, at a no-till demonstration conducted on their farm by the Soil Conservation Service's Alabama State Office, the Pike County SWCD, a machinery manufacturer, and a chemical company.

Pike County farmer Jerrell Harden calls his working model of a no-till planter the "Ole Blue Goose."





The next year, the Harden brothers and their father, J. C. Harden, planted no-till corn in a residue of rye using a conventional no-till planter. In one field, they subsoiled prior to planting and had excellent results. In another field, the plants were stunted and the yield was low; the soil had become so compacted that the corn roots had stopped growing at a depth of 6 to 14 inches. The roots of corn in good soil normally reach a depth of 6 feet in 3 months.

To find out more about their problem with compacted soil, the Hardens turned to the Pike County SWCD and SCS. Charles Pollard, then SCS district conservationist in Troy, and Lewis Williams, SCS State conservation agronomist, directed them to the National Tillage Machinery Laboratory in Auburn, Ala.

A. C. Trowse, Jr., laboratory soil scientist, identified the Harden's

problem in their low-yield cornfield as "plowpan," soil compacted by farm machinery. It is a common problem on the sandy soils in the southern Coastal Plain.

It was after their meeting with Trowse that the Hardens decided to redesign their planter to combine subsoiling and no-till planting into one operation. Jerrell Harden, described by Trowse as a "mechanical genius," made sketches of the design changes, then constructed test models of redesigned implements for the planter. His objective was a planter that would work well even in compacted soil and would cut down drastically on machinery traffic.

In 1974, the Hardens were ready to try out the renovated planter. They seeded 200 acres of corn in a cover of killed rye. That year, their yield averaged 100 bushels an acre. In

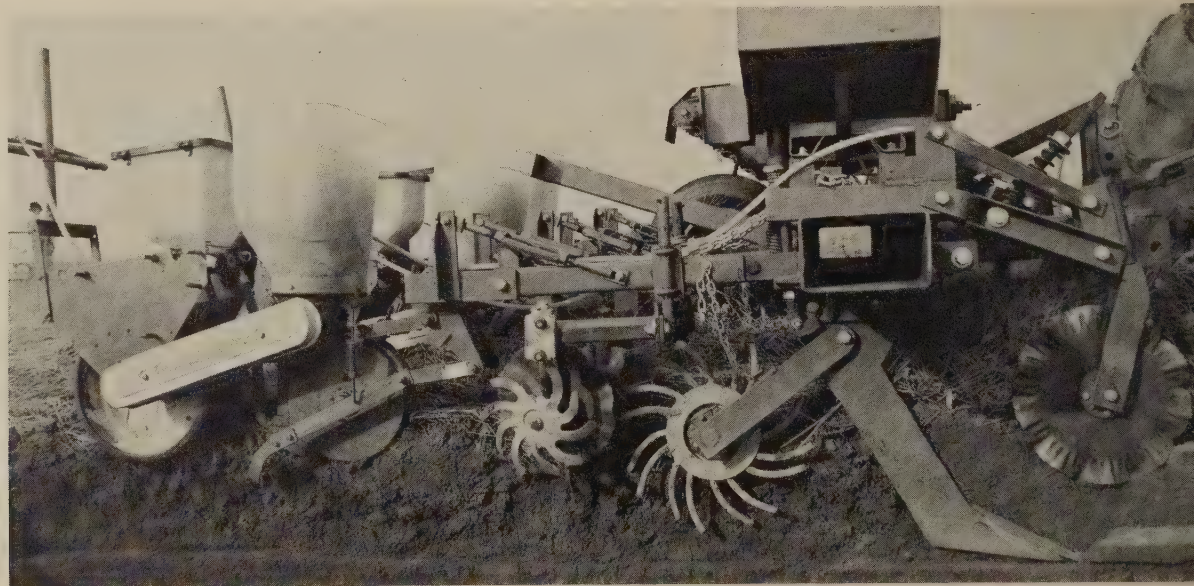
1975, they had the same yield—compared with the Pike County average of 40 bushels an acre.

What was unusual about their planting method was that by combining no-till planting with subsoiling, they restricted traffic during planting to a single trip across the field. The Hardens called the one-trip, no-till planting "no-till-plus," and both the name and the method caught on quickly.

Trowse did not think no-till-plus would work in the Hardens' compacted fields. "I advised against it," he said but readily admitted he was glad it had worked.

Jerrell and Leo Harden patented their inventions and incorporated them in a new no-till planter called a "superseeder." It is being manufactured by a company partly owned by the family in nearby Ozark, and by mid-1977 the company was

The Hardens incorporated their inventions in a no-till planter they call a "superseeder."





doing a thriving business.

A spike-toothed, slot-filler wheel is unique to the Hardens' planter. In tandem, the wheel follows the spring-loaded coulter and subsoiler shank to fill the slot cut by the subsoiler, thus preventing seeds from dropping down too far into the soil. Equipment for incorporating herbicides and fertilizers in the slot or on the surface and a conventional planting unit follow the wheel.

"Even with a 3-inch rain, there's no run-off on no-tilled, in-row subsoiled land because the subsoiled slot is like a funnel," said Jerrell Harden.

In March 1977, a sandstorm in Pike County killed some conventionally tilled crops and seriously eroded the land, but there was little sand or wind damage to the Hardens' no-till-plus corn, according to Pollard.

Kenneth Sanders, a cooperator with the Coffee County SWCD, used

the planter in 1977, and obtained 80 bushels of corn an acre—a high yield for that area during severe drought conditions. He said that his neighbors' conventionally tilled corn crops were so poor that they did not bother to harvest them.

No-till-plus also has worked well on soybeans. The Hardens' soybean yield in 1974 averaged 44 bushels an acre, compared with the statewide average of 24 bushels an acre.

No-till acreage increased statewide from 12,000 acres in 1972 to more than 100,000 acres in 1977, and the SCS State office in Auburn reports a big increase in requests for information about no-till farming.

"Saving water alone may turn farmers to no-till," said Leo Harden. "If you lose water in a field, you are losing soil and money."

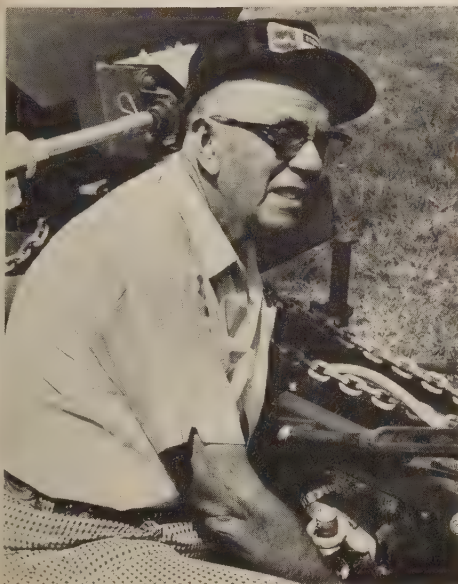
"You can't beat a method like no-till-plus. It saves the soil and water

and gives the farmer a greater reward for his efforts in higher yields and big savings in energy and labor costs," J. C. Harden noted.

The Hardens' planter and conservation tillage method are being evaluated by the U.S. Department of Agriculture's Science and Education Administration and the Alabama Agricultural Experiment Station. It is the first major research on no-till conducted in all areas of the State.

"If the planter and the method are as effective in saving soil, water, energy, and labor over a long period as they were in the first trials, they could revolutionize cultural practices in the southern Coastal Plain," said SCS State Agronomist Williams.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.



At left, J. C. Harden, showing no-till planter invented by two of his sons, is an eloquent advocate of no-till cropping. At right, Jerrell Harden (left) and SCS District Conservationist Charles Pollard examine good growth of no-till soybeans which were planted in rye stubble by in-row subsoiling.



by Nadine E. Pitts

Solving Tough Tillage Problems

The USDA's 44-year-old National Tillage Machinery Laboratory has made numerous contributions to improve farm machinery and tillage practices.

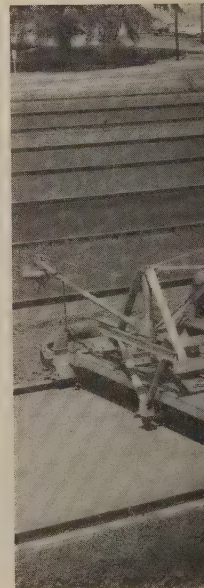
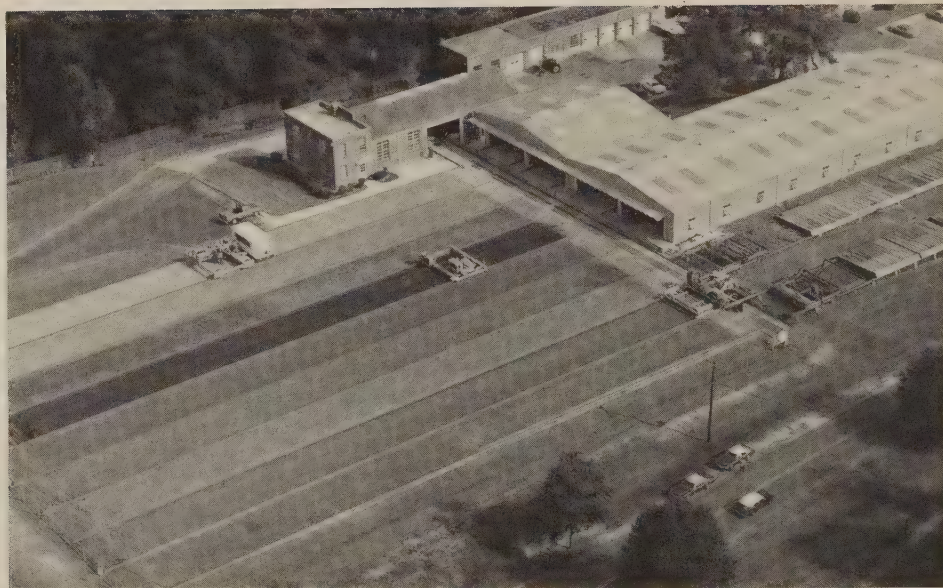
Too wet and sticky to plow? That age-old complaint has led some farmers to leave some of their land in sod for years.

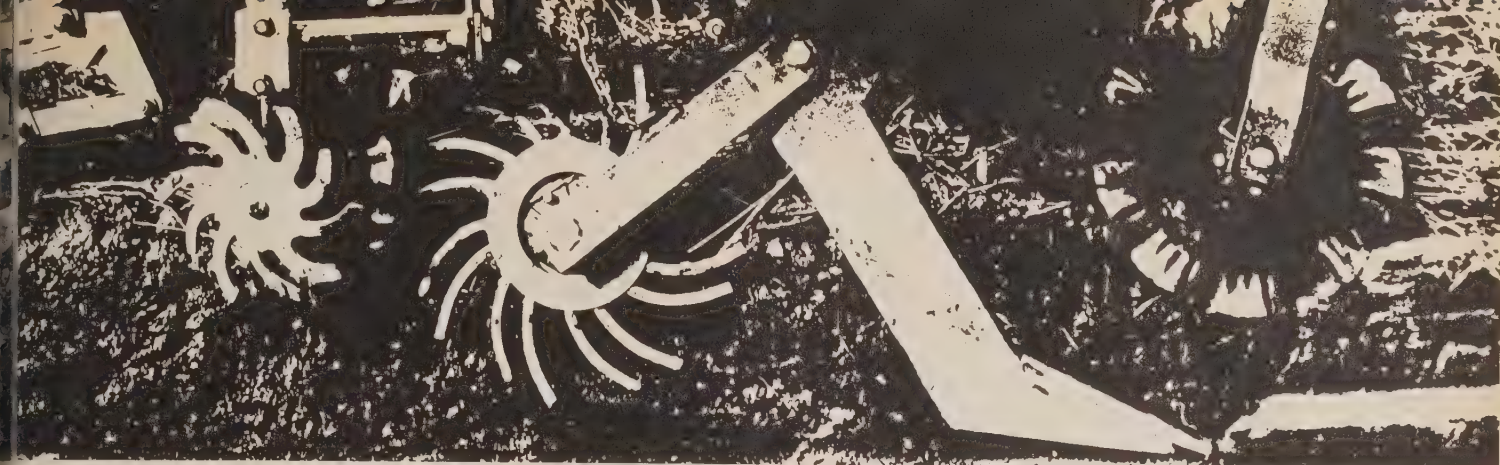
Now the complaint may decrease, thanks to the work of scientists at the National Tillage Machinery Laboratory (NTML) of USDA's Science and Education Administration (SEA). The laboratory was formerly under the Agricultural Research Service, which is now a part of SEA.

Researchers at the laboratory have been studying the effects of farm machinery on soils for more than four decades on a 6.3-acre site within the campus complex of Auburn University, Ala.

NTML was created in 1935 to undertake research related to tillage practices and machine use in cotton production. The scope of the

Nine, 150-foot-long outdoor bins containing various soils are equipped with side rails which allow researchers to test a single element of a piece of machinery at varying forces.





laboratory's research has since broadened to include all types of tillage machinery and practices.

The lab's staff of 35, headed by W. R. Gill, soil scientist, includes seven agricultural engineers and two soil scientists. The staff has some unusual research facilities, such as nine outdoor bins containing soils on which tillage machinery can be tested at varying speeds. The staff also uses indoor soil bins and a controlled environment chamber to evaluate root growth under differing climatic conditions.

The bulk of the lab's research is carried out in its own facilities, although NTML has access to larger tracts for field studies. Its clientele includes farm machinery manufacturers and other researchers who seek the lab's advice and assistance on model changes and

improvements affecting many farmers and large land areas. The staff occasionally works with individual farmers like the Hardens in Alabama. (See article beginning on p. 9.)

Known worldwide as an authority in its field, NTML has made numerous noteworthy contributions to soil conservation and modern farming. One answer to the problem of wet and sticky soil is the laboratory's most recent invention, the lubricated moldboard plow.

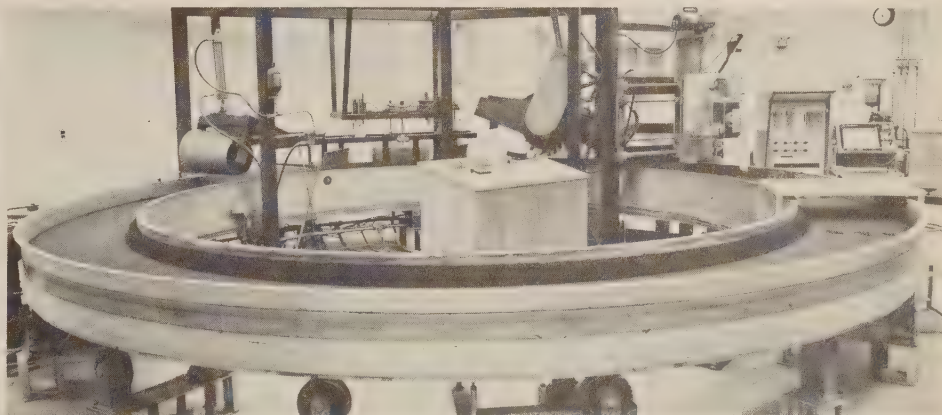
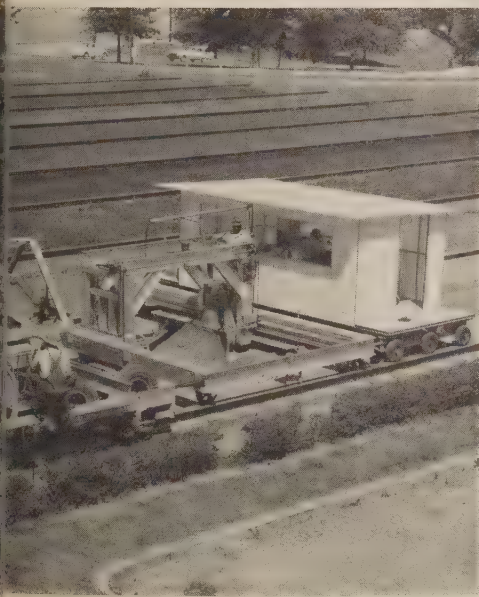
Over the years, NTML personnel, in cooperation with private industry, developed improved models of plows which operate well in highly adhesive soils such as Houston clay.

One early model, in which the moldboard of the plow was covered with a heavy plastic material, is still in use in southwest Georgia. Though the plastic is not extremely durable,

it successfully buries peanut trash deep enough to control disease and decreases the plowing force by as much as 25 percent.

A recent plow model developed by Robert L. Schafer, an agricultural engineer with NTML, and others in cooperation with private industry is lubricated with a biodegradable, 2- to 3-percent polymer-water solution. All a farmer may need to convert a conventional moldboard plow into a lubricated plow is an inexpensive distribution system and the lubricant. Other components are similar to those used for spraying and other farm operations.

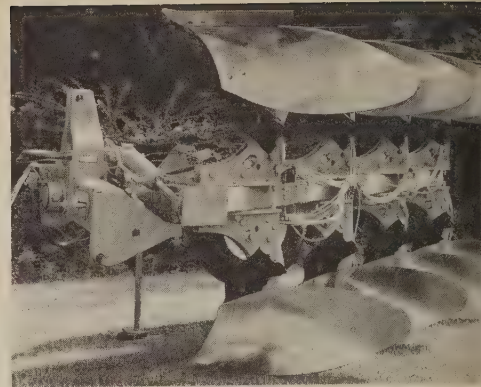
"There are lots of advantages to the lubricated plow," said Schafer. "It reduces the amount of energy required to pull it, it improves scouring and self-cleaning, and it turns the soil more efficiently."



Left, as machinery attached to a power car rides the rails for testing, an instrument car simultaneously collects data and transmits it to computers for analysis.

Above, a small, circular indoor bin is used to test models of farm equipment on synthetic soils.

NTML engineers modified a reversible plow (near right) so tubing carries lubricant through a slitted keystone (far right) to the plow blade.



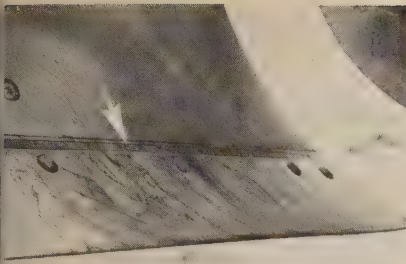
The laboratory also conducts studies on cropland damage caused by uncontrolled machinery traffic.



Above left, the root growth of conventionally planted corn is cut off by compacted soil layer called plowpan. Above right, subsoiling in a cover crop of rye breaks the plowpan and allows roots of next crop to grow normally.



Research was conducted at the laboratory on cotton grown using conventional tillage (far left) and using subsoiling and controlled traffic.



One answer to the problem of wet and sticky soil is the lab's most recent invention, the lubricated moldboard plow.

The same lubricating principles can be applied to bulldozers and other equipment, and NTML is testing a lubricated lister.

"The lubricated lister will help to prepare sticky soil in the fall and allow early planting of some wetlands formerly restricted to sod," said Gill.

The researchers have also studied the effect of tractor and other farm equipment tires on soil. Innumerable tests were made with tire lugs and treads of varying shapes and sizes prior to NTML's recommendations for improvements.

"Tires began to change in size and shape as demands for equipment able to carry heavier loads and travel at faster speeds increased," Gill remarked. "NTML's problem was to determine what designs were best suited for meeting farmers' needs."

The NTML also conducts studies on cropland damage caused by uncontrolled machinery traffic. The lab began with extensive research on cotton cropland and later expanded the research to include crops such as corn, peanuts, and soybeans.

Soil Scientist A. C. Trowse, Jr., is the principal researcher of the traffic studies. He found that soil compacted by machinery could be avoided when traffic is controlled or confined to the same lanes each year.

Farmers often find it difficult, however, to locate tire tracks from one year to the next. A study underway at the Alabama Agricultural Experiment Station (AES), with the cooperation of NTML, is designed to solve the problem.

"Tractors are being steered by an automatic guidance system," said Schafer, "and programmed to locate

and run in the same 'roadbed' time after time."

The NTML staff frequently consults and cooperates with other SEA scientists and agricultural experiment stations in all the States. The staff assisted the Alabama AES, for example, in its evaluation of subsoilers, including the one on the Harden family's no-till planter.

When research results reach farmers and help them improve their land and crops, NTML scientists feel rewarded.

"Some farmers have begun to heed our findings about the importance of controlled traffic," said Director Gill, "and both their soils and their crop yields are improving."

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.

Charter of the National Tillage Machinery Laboratory

The National Tillage Machinery Laboratory conducts research in soil-machine-plant relations. The objective of the laboratory is to increase the efficiency and effectiveness of tillage and traction machinery by developing a better understanding of soil-machine-plant relations. Anticipated benefits are improved crop production and conservation of energy, soil, and water resources.

The research program includes investigations of:

- The identification and characterization of soil and machine parameters and the determination of their integrated role in governing soil-machine relations.
 - The performance of model and full-scale, ground-engaging components of machines in terms of design and energy indexes and soil-machine relations.
 - The influence of tillage, traction, and transport machines on soil physical conditions, runoff, and erosion.
 - The relation of soil physical conditions and mechanical properties to wear, durability, and performance of machines, and to the growth of plants.
 - The materials and processes suitable for improving the design, construction, and use of ground-engaging components of machines.
 - The soil conditions required by plant roots, and methods of creating and maintaining these conditions in conservation tillage systems.
-

More than a decade ago, two North Carolina farmers began experimenting with minimum tillage. Today, they consider their experiments successful in saving soil and energy.

by Wilton U. Smith

Minimum Tillage Pioneers

In 1962, when the Wilder brothers of Franklin County, N.C., first heard about minimum tillage, they were cautious. So they borrowed a fluted coulter, attached it to their planter, and planted their first minimum-tilled field of milo.

In 1966, impressed by the fuel and labor savings and soil and water conservation, Larry and Melvin Lee Wilder bought their own fluted coulter and planted 1,000 acres of corn and another 1,000 of soybeans, using minimum tillage.

"Because we started experimenting with minimum tillage back in 1962, I guess you could call us minimum tillage pioneers," said Larry Wilder. "We've never been sorry we tried it."

The Wilder brothers have been cooperators with the Franklin Soil

and Water Conservation District since 1961. With assistance from the district and the Soil Conservation Service, they developed a conservation plan in 1963 that included terracing and stripcropping. But in 1971, they revised their plan to include minimum tillage because of their successful experiments with it.

In 1977, they planted 900 acres of corn—virtually all minimum tillage—and 450 acres of barley. Another 450 acres were planted in minimum-tilled soybeans and 450 acres in conventionally tilled soybeans.

The Wilders rotate soybeans and corn, mainly for weed, insect, and disease control. They plant their minimum-tilled soybeans in barley residue as soon as the grain is cut.

"You have to use residue for minimum tillage," said Larry Wilder, "because it's too expensive to establish sod."

In some recent years, they have also grown wheat. But, as Larry Wilder explained, "We prefer to grow barley because we like those high yields."

The brothers' corn yields have been as high as 130 bushels an acre, but they average 85 to 90 an acre, still above the county average.

"Our farmland averages 5 inches of topsoil and with minimum tillage we make sure we don't lose any," explained Larry Wilder. "Minimum tillage is the way we can stay in farming."

Mr. Smith is district conservationist, SCS, Louisburg, N.C.

Farmer Larry Wilder examines his six-row minimum tillage planter



No Drought in Paradise

by Beverly J. Miller

Last year's drought had little effect on the residents of Paradise. Instead, they were reaping the benefits of a gravity pressure sprinkler irrigation system that had been installed 5 years before.

But residents of this small northern Utah community weren't always so fortunate.

"In the olden days, earthen ditches and canals were used to flood irrigate cropland and some yards and gardens," said Burnard White, mayor of Paradise. "These open ditches and canals were dangerous to our children, were difficult to maintain, and didn't deliver a dependable water supply.

"Also, people were using the good-quality drinking water instead of irrigation water to keep their lawns green. Before the new irrigation system, nearly two-thirds of the homes ran out of irrigation water for lawns," he continued. "Now we've all agreed not to use the drinking water for irrigation."

The sprinkler system eliminated the ditches and canals. Now, underground pipelines deliver irrigation water about every half-block in town and to the surrounding farmland as well—a total of about 480 acres.

The system was designed to improve the efficiency of irrigation water delivery, but only the system's users could improve the efficiency of water application.

To help area farmers, Soil Conservation Service technicians showed them how to use a soil auger to sample soil and check the soil's water content. The farmers learned

A gravity pressure sprinkler irrigation system provides a community in Utah with a dependable water supply. Farmers have enough water even at critical irrigation periods.

One of the results of the gravity pressure irrigation system in Paradise is increased crop production.



how to determine whether their soil needed water and, if so, how much.

With the irrigation system, area farmers can depend upon having enough water for their crops, even at the most critical irrigation periods.

"Residents agreed to a watering schedule of 12 hours every 7 days on crops and anytime for yards and gardens," explained Mayor White. "And now, because they know when and how much to water, they're using only half the amount they used before the system was installed."

Overall irrigation efficiency has increased from 25 to over 65 percent during the past 5 years. Crop production has increased and the community has benefited economically.

"If it weren't for this new irrigation system," said White, "my water bill would have been more than \$250 this year. As it is, I'm only paying about \$60."

Partly because water is readily available now, property values have

increased from about \$1,000 for a 1¼-acre lot to over \$6,500.

The gravity pressure system is an energy saver because pumps are not needed. An added benefit, according to Mayor White, is improved fire protection—"in the summer, it's the best in Utah."

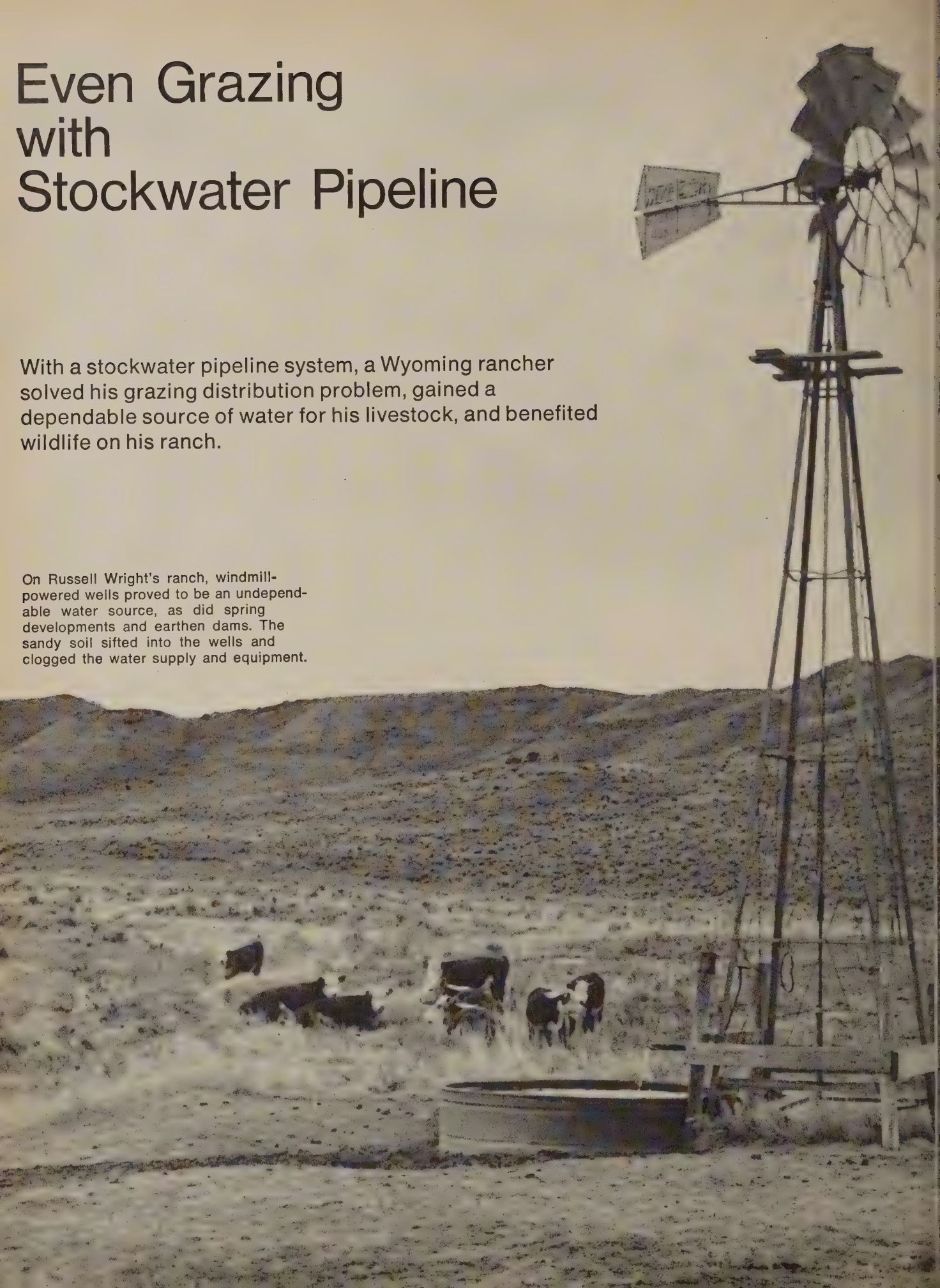
The Paradise irrigation system was installed through efforts of the Paradise Irrigation and Reservoir Company, Paradise City, and Blacksmith Fork Soil Conservation District. SCS provided technical and financial assistance through the Bear River Resource Conservation and Development (RC&D) area. The construction cost for the project was about \$106,500. Local funds paid \$66,000 of the cost and the rest was paid with RC&D cost-share funds.

Ms. Miller is public information officer, SCS, Salt Lake City, Utah.

Even Grazing with Stockwater Pipeline

With a stockwater pipeline system, a Wyoming rancher solved his grazing distribution problem, gained a dependable source of water for his livestock, and benefited wildlife on his ranch.

On Russell Wright's ranch, windmill-powered wells proved to be an undependable water source, as did spring developments and earthen dams. The sandy soil sifted into the wells and clogged the water supply and equipment.



Russell Wright had a problem common to many ranchers in eastern Wyoming: he couldn't find a dependable way to water his cattle in different parts of the range to distribute grazing evenly. Now he's found the solution in a sophisticated stockwater pipeline system.

"We went to the pipeline because we've spent well over \$30,000 in these hills building earthen dams, developing springs, and drilling wells, and none have been satisfactory. We think this pipeline finally is going to work," said Wright. He has operated the 9,100-acre ranch near Buffalo, Wyo., along with his sons since 1957.

The pipeline system begins with a shallow well beside Clear Creek, near the ranch headquarters. A 2-horsepower pump draws water from the creek and forces it through 23,000 feet of 2-inch plastic pipe into two 12,000-gallon storage tanks at the highest elevation on the ranch, 4,700 feet. The pipeline and storage tanks are buried 5 feet deep to avoid the frost, and an ordinary light bulb in the well keeps the pump from freezing.

Float valves in the storage tanks shut off the pump when the tanks are full by tripping a pressure switch at the well. From there, the system works by gravity.

"When the Soil Conservation Service designed the system, I thought it would take a 3-horsepower pump to do the job, but the pump company guaranteed the 2-horsepower, which saves some energy," said Wright.

The completed system will include four watering tanks along the main

line and 15 additional watering tanks along nine spur lines, which will radiate out from the storage tanks.

A float valve in each tank, similar to the float valve in a toilet tank, maintains the water level. When the tank is full, a frost-free hydrant drains excess water back underground instead of letting it stay in the above-ground part of the pipe where it could freeze. Wright also floats a wooden plank in each tank "to keep the birds from drowning."

A cooperator with the Lake DeSmet Conservation District, Wright requested that SCS design the pipeline system to meet the requirements of 600 head of cattle on 8,800 acres of range. He installed the well, main line, storage tanks, and first two spurs last summer under his Great Plains Conservation Program contract.

"Already we're seeing better use of our pasture," Wright said. "In one area the grass was mostly wasted because the cattle had to travel more than a mile to get to water. In another part of the ranch, the cattle had to climb a high hill to get to

water—that made almost a whole section useless. But since we installed the new tanks, both areas are pretty well grazed."

In addition, the completed system will give Wright the option of starting a planned grazing system. Without the pipeline, he was forced to let the cattle graze wherever water was available.

"My stockwater pipeline also benefits my flock of 127 sheep and the wildlife on my ranch. We have 300 head of deer or better," Wright said. "At one time, we had a couple hundred head of antelope, but there are only about 50 today. We also have Wyoming sage hens, prairie chickens, pheasants, Hungarian partridge, quail, ducks, and some Canadian geese. Of course, the bobcats are plentiful, and so are coyotes, badgers, and skunks. Directly or indirectly, all the animals benefit from a better water supply."

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.



Russell Wright (left) and SCS District Conservationist Frank Neal check the shallow well that draws water from Clear Creek to supply the stockwatering system.

Double Duty Dams

by Robert L. Harryman



Gullies were eating into county roads and damaging adjacent farmland (far left). Roadway embankment dams help stabilize gullies, improve roads, and provide water for livestock and wildlife (near left).

People in Mercer County, Mo., wanted to stop gullies, reduce sedimentation, improve township roads, and reduce road maintenance costs all at the same time. Roadway embankment dams proved to be the answer.

Storm runoff formed gullies 10 to 25 feet deep that were eating into county roads and damaging adjacent farmland in Mercer County and in the eight other counties making up the Green Hills Resource Conservation and Development (RC&D) Area. Runoff was digging out the soil from around and under road bridges until they were no longer anchored in the ground. Bridges and large culverts or pipes were constantly washing out. Water rushed through uncontrolled, adding to erosion problems further downstream.

The Green Hills RC&D Council helped the counties build roadway embankment dams to stabilize gullies and even provide water for livestock and wildlife.

The RC&D measures involved building a dam to replace small bridges or large culverts, forming

reservoirs on the upstream side of the dam. Pipes 24 inches or less in diameter let the water through slowly into the channel below the dam. The pipes are designed to flow full of water and are made of smooth, high-quality steel.

Planning and building a road dam takes the cooperation of landowners, the township board, the county board, the county courts, utility companies, and the local soil and water conservation district. Easements must be obtained where construction will affect private property, and often, utility lines must be moved.

Generally, the best sites for roadway embankment dams in the Green Hills RC&D area drain 300 acres or less and are in depressions between two hills.

Based on storm frequency data, the dams draining small areas are built high enough and with an adequately designed spillway to safely handle unusually heavy rainfalls. Emergency spillways are built into dams that drain large areas.

In the last 2 years, the RC&D

council assisted with construction of 12 roadway embankment dams in the 9-county area. Construction on 20 more structures is planned for 1978.

"We hope that in a few years it will be a common practice to build roadway embankment dams where they will solve a gully problem," said Marion Houghton, former chairman of the RC&D council. The roadway embankment dam structures control erosion, improve roads, and provide water for livestock and wildlife.

The Soil Conservation Service provides technical assistance through the local soil and water conservation districts in designing the dams and provides financial assistance on the projects through the RC&D program. The townships and counties where roadway embankment dams are built also help fund construction and are responsible for the proper operation and maintenance of the structures.

Mr. Harryman is RC&D coordinator, SCS, Bethany, Mo.

Taking Stock of Roadside Erosion



Coal County employees pour and shape concrete liner to control roadside erosion.

Erosion along county roads in Oklahoma had been recognized as a source of pollution for several years. But not until June 1977 did anyone know how extensive the problem was.

Oklahoma conservation districts and the Soil Conservation Service worked together on roadside erosion inventories for each of Oklahoma's 77 counties. After completing the inventories in June, they determined that more than 2.5 million tons of soil are lost annually through erosion along county roads.

Conservation district employees and soil conservationists and technicians drove every mile of county roads to pinpoint areas of erosion. They marked the locations of eroded areas on county maps and indicated the extent of erosion.

The conservation districts published the inventories and distributed copies to county commissioners, county planning boards, and State and Federal agencies to help them in planning and applying roadside erosion control.

The county roadside erosion inventories are especially useful to the

Oklahoma Department of Pollution Control which has responsibility in the State for meeting water quality goals under Section 208 of Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972. The inventories are a guide to reducing sediment, a nonpoint source of pollution.

Using the inventories, county commissioners have already begun treating roadside erosion problems in Oklahoma. They are working on shaping and vegetating roadsides, lining runoff channels with concrete, and building road dams.

SCS is providing technical assistance on the projects through the conservation districts. Cost-share assistance also is available through SCS.

The Oklahoma Conservation Commission is providing up to \$1,000 of matching funds to county commissioners for roadside erosion control projects.

Mr. Phillips is public information officer, SCS, Stillwater, Okla.

USDA Finds Soil Erosion at Unacceptable Levels

Soil is being washed away on the Nation's cropland at an average rate of 9 tons per acre per year—nearly twice the rate considered “acceptable” by soil conservationists, according to M. Rupert Cutler, assistant secretary for conservation, research, and education of the U.S. Department of Agriculture.

The soil loss rate was included by the Soil Conservation Service in a new study of erosion and sedimentation, made as part of the agency's commitment to the 1975 National Water Assessment of the U.S. Water Resources Council.

The study examines soil erosion from water action in 18 water resource regions covering the continental United States. Average annual erosion ranges from a high of 23 tons of soil per acre in the Lower Mississippi region to a low of 1 ton per acre in the California region.

Severe annual soil losses also occur in: the Tennessee region—19 tons per acre; the South Atlantic Gulf region—18 tons per acre; the Middle Atlantic region—14 tons per acre; the Upper Mississippi region—10 tons per acre; and the Ohio region—9 tons per acre.

In 1975, when data for the study were collected, total U.S. soil losses on cropland totaled 2.8 billion tons.

“Had there been no soil conservation treatment on the land,” said Cutler, “soil losses that year would have reached an estimated 3.8 billion tons.”

He added that conservation treatment needs to be applied to save an additional 1.3 billions tons of soil per year before acceptable levels of loss can be reached.

The SCS study also found that it is technically feasible for the United States to produce the food and fiber

it will need to meet projected demand in the year 2000 and still achieve acceptable levels of erosion control.

“Soil losses could be reduced from the present average of 9 tons per acre per year to only 3 tons per acre per year without adversely affecting our ability to produce more farm commodities,” Cutler explained. Actual losses, of course, would vary widely from farm to farm and region to region, because of soil types, slope, and other factors.

He added, however, that achieving this goal would require extensive expansion of land treatment from current levels. Nearly 42 percent of the 335 million acres of cropland harvested in 1975 were not receiving adequate treatment for soil erosion control, Cutler said.



A study examining soil erosion from water action reports average soil losses as high as 23 tons per acre per year.

Guide to Resource Planning

The Soil Conservation Service in Montana has a unique tool for resource planning. Its publication, "Climax Vegetation of Montana Based on Soils and Climate," includes the first climax vegetation map published for an area of the United States based strictly on soils and climate.

Climax vegetation refers to the natural plant communities expected to occur in a combination of soils and climate where the soils have not been excessively disturbed by external forces—man, animals, or fire.

The publication also includes a report which categorizes geographic areas of Montana on a broad scale. It gives the annual average precipitation in different areas of the State and describes groups of soils that have similar characteristics and the corresponding vegetation.

The authors, Robert L. Ross, State range conservationist, now retired, and Harold E. Hunter, State woodland conservationist for SCS in Montana, say they designed the map for use in broad resource planning.

"You can't look at the map and make specific recommendations because the delineations are too broad for that," Ross said. "But if you're looking for alternative routes for a powerline or a waterline, for example, the map could show you where revegetation would be easier after construction."

"But, after determining possible alternative routes," Hunter added, "a more intensive on-site investigation would be needed."

There are many relatively undisturbed areas in the State where the authors could make detailed studies of the soil, climate, and vegetation. Information from the studies enabled them to predict what the natural vegetation would be on disturbed areas that had similar soils and climate.

In developing the climax vegetation map and report, Ross and Hunter had help from SCS employees in field locations throughout Montana, from Montana State University, the University of Montana, and other Federal and State agencies.

Meetings:

April

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| 4-6 | Garden Club of America, Birmingham, Ala. |
| 5-7 | Engineering Geology and Soils Engineering Symposium, Boise, Idaho |
| 9-11 | American Pulpwood Association, Atlanta, Ga. |
| 9-12 | Association of American Geographers, New Orleans, La. |
| 17-21 | American Geophysical Union, Washington, D.C. |
| 19-21 | Air Pollution Control Association, Conference on Methodology for the Assessment of Air Pollution Effects on Vegetation, Minneapolis, Minn. |
| 19-21 | Hardwood Plywood Manufacturers Association, Panama City, Fla. |
| 24-26 | National Academy of Sciences, Washington, D.C. |
| 29-May 4 | American Society of Planning Officials, Indianapolis, Ind. |
| 30-May 2 | Chamber of Commerce of the United States, Washington, D.C. |

May

- | | |
|-------|--|
| 1-5 | League of Women Voters, Cincinnati, Ohio |
| 6-7 | Sierra Club, San Francisco, Calif. |
| 6-9 | National Forest Products Association, Washington, D.C. |
| 17-19 | Boy Scouts of America, Phoenix, Ariz. |
| 17-19 | Southern Forestry Conference, Savannah, Ga. |

June

- | | |
|-------|--|
| 4-8 | National Council of State Garden Clubs, Inc., Detroit, Mich. |
| 4-9 | General Federation of Women's Clubs, Phoenix, Ariz. |
| 11-15 | Outdoor Writers Association of America, Virginia Beach, Va. |
| 19-27 | Soil Science Congress, Edmonton, Alberta, Canada |
| 24-29 | National Environmental Health Association, Snowmass, Colo. |
| 25-28 | American Plywood Association, Portland, Oreg. |
| 25-28 | National Watershed Congress, Toronto, Ontario, Canada |
| 25-29 | American Seed Trade Association, Inc., Kansas City, Mo. |
| 25-30 | American Water Works Association, Atlantic City, N.J. |
| 26-30 | Air Pollution Control Association, Houston, Tex. |
| 27-30 | American Society of Agricultural Engineers, Logan, Utah |
-

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Soil Conservation

May 1978

U.S. Department of Agriculture

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Wildlife Survival—A National Concern

From the Administrator

Competition for living space often pits mankind against wildlife—and, as a result, wildlife populations almost always diminish.

For many urban and rural Americans, this is profoundly disturbing.

That is why Glenn H. LeDioyt felt reassured when a covey of Hungarian partridge arrived at his north-central Nebraska farm last year. (See article on page 6.) As he said, "We were as thrilled about it as we were when we calculated that our corn production was over 150 bushels per acre."

LeDioyt's enthusiasm reflects growing national interest in the future of fish and wildlife populations.

Privately owned farms, ranches, and forests—which make up more than half of America's land resources—provide homes for much of the Nation's fish and wildlife. On farmlands, food and fiber production is of primary importance. Yet many acres used for agriculture, range, or forestry also offer ideal nesting sites, food, and cover for a variety of wildlife, as people like Glenn LeDioyt know firsthand.

When a landowner installs conservation practices that protect soil and water resources and sustain yields, he or she also provides wildlife habitat. Stripcropping, farm ponds, windbreaks, woodland management, range seeding, and many other practices make good habitat for wild creatures if properly designed, constructed, and used.

A landowner who wants still better wildlife habitat must, however, use such *additional* conservation measures as grassy nesting areas, wooded escape cover, and properly distributed winter feed. It is a correct combination of practices that fills the gap between conservation for food and fiber and conservation for acceptable wildlife habitat. More and more landowners are working through their local soil and water conservation districts to achieve this goal.

When asked why he planted trees and shrubs for wildlife when more pressing work remained to be done, a farmer spoke for many when he replied, "I seldom have the time to observe the birds and animals that nest in my hedgerows, but it makes me happy just to know that they are there."

That is enough incentive for the Soil Conservation Service to give all the help it can in improving wildlife habitat.

Mel Davis

Soil Conservation is the official magazine of the Soil Conservation Service. The Secretary of Agriculture has determined that publication of this periodical is necessary in the transaction of public business required by law of the Department. Use of funds for printing *Soil Conservation* has been approved by the Director of the Office of Management and Budget through July 31, 1978.

Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Cover:

Wyoming law requires that a reclamation plan be developed for all land disturbed by coal mining. See pages 11 through 18 for an article about surface mine reclamation in Wyoming and Montana. (Photo, Anne Schuhart.)

Soil Conservation

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Wildlife and Watersheds



Planning a little extra land for habitat around watershed reservoirs could make a big difference for wildlife.

Canada geese were among the most common species spotted at the reservoirs.

by Mike W. Anderson

A study in Nebraska proved that Public Law 566 watershed reservoirs attract a wide variety of wildlife.

Some doubt existed that the watershed reservoirs provided habitat for significant numbers of wildlife because the reservoirs were not fenced in and the perimeter areas of many were grazed or used for crops.

The Soil Conservation Service in Nebraska contracted the Associated Environmental Service Company (AESCO) to monitor wildlife for 1 year at 90 sample watershed sites in the State to find out the numbers and kinds of wildlife that used the reservoirs and perimeter areas.

"We selected a representative sample of watershed dams based on engineering characteristics, location, and age," said William B. Patterson, SCS assistant State conservationist for water resources in Nebraska. The sites varied from small weir structures with no permanent water storage to reservoirs with 149 acres of surface water.

"We needed proof that large numbers of wildlife use and inhabit areas around watershed reservoirs. The information could encourage sponsors of watershed projects to obtain enough land around dams and reservoirs for permanent wildlife habitat," said Bob Koerner, SCS State biologist.

C. Michael Cowan, president of AESCO, and one assistant began the wildlife survey in June 1975. They visited each of the 90 sites once every 6 weeks, taking photos and recording their observations of wildlife.

The report of the team's findings,

"Wildlife and Watersheds in Nebraska," identifies 186 different species of wildlife. The team spotted 148 species of birds. Twenty of those were waterfowl. "We spotted more than 16,000 ducks and geese," said Cowan. "Migratory waterfowl used all but about 10 of the reservoirs we visited. Most species used the reservoirs just for resting and feeding, but we also observed some species courting, nesting, and rearing their young."

The number of waterfowl at each reservoir varied from a few strays to flocks of hundreds of birds. The most common species, some spotted a thousand times or more, included Canada geese, snow geese, mallard ducks, pintail ducks, widgeons, and blue-winged teals.

"The watershed impoundments increase the acreage of surface water available to waterfowl, opening a larger area of suitable habitat for the birds during migration," said Cowan. "This reduces the concentration of birds at rivers and lakes and decreases the spread of disease among the birds."

Some birds spotted 300 times or more included American coot, bobwhite quail, ringed-neck pheasant, mourning dove, and common flicker.

The survey team also spotted muskrat, raccoon, eastern cottontail, and white-tailed deer around the reservoirs. Bullfrogs, leopard frogs, snapping turtles, and garter snakes were common. Fish identified in the reservoirs included carp, channel catfish, bluegill, largemouth bass, and black bullhead.

Cowan explained that the water-



shed dams and reservoirs along streams reduce the chances of erosion, flooding, and sediment damage, and can, if properly maintained, create new and varied habitat for a large number of wildlife species. In Nebraska, the many Public Law 566 watershed reservoirs and their perimeter areas are ideal for permanent, year-round habitat for wildlife. SCS recommends keeping about 10 meters of good wildlife habitat between the shoreline of reservoirs and farmland. Grasses along the perimeters of reservoirs provide cover for nesting and help filter sediment from runoff—benefiting fish and improving water quality.

Cowan concluded that for the reservoirs and the perimeter areas to be most beneficial to wildlife they must be properly maintained. As many native plant species as possible should be retained along the perimeters, or the perimeter areas should be planted with a variety of grasses, trees, and shrubs. "Grazing should be kept to a minimum and livestock watering confined to a small part of the perimeter," Cowan said.

"In many cases, where the reservoirs are surrounded by land that is extensively cultivated, the vegetation on reservoir perimeters provides the only cover for upland game birds," said Cowan.

Mr. Anderson is a biologist,
SCS, Lincoln, Nebr.

Nebraska farmers are finding a good use for uncultivated corners in center-pivot irrigation systems: improved habitat for wildlife.

by Jeffrey K. Butcher



And in This Corner...

Wildlife

"I like wildlife. If you can tell me how to make a good living from the land and still have a place for wildlife, I would be all for it."

The time was 20 years ago. The speaker was a farmer explaining his interest in a conservation-wildlife habitat system to Soil Conservation Service Biologist Robert O. Koerner.

Koerner, now SCS State biologist in Lincoln, Nebr., had just started his career. At the time, he recalls, installing such a system required a good deal of ingenuity. The job is even more challenging today.

But it can be done.

One fresh opportunity in Nebraska derives from rapid conversion of land from idle or dryland farming to sprinkler irrigation. Center-pivot irrigation systems form circular cultivated tracts with four unirrigated and frequently uncultivated "corners." When managed with wildlife in mind, these corners offer birds and animals much-needed food and cover.

Nebraska already is the third largest among States with land under irrigation. Each corner of the center-pivot system contains from 4 to 8 acres. Koerner believes that "some of the best pheasant hunting in Nebraska could be provided in irrigated areas, if nesting and winter food and cover could be developed."

Fountain Farm at O'Neill, Nebr., illustrates his point. The LeDioyt Land Company, which manages this farm, strives to balance economics, natural resource conservation, and wildlife. Since 1967, the company has planted trees in just about every corner on 20 quarters of center-pivot irrigated land.

"The trees protect our livestock feedlots and buildings, besides providing erosion control and food and cover for wildlife," said Farm Superintendent Alfred Straka. "I certainly recommend this practice to others." So far, he has planted an estimated 85,000 trees, using a windbreak-wildlife conservation plan prepared with SCS assistance.

Straka wishes he'd started the work 20 years ago. "This land used to be mostly prairie," he recalls, "and game bird populations consisted mainly of prairie chickens and grouse. The native species became reduced when the prairie was converted to cropland. However, in the last 10 years, we have seen an increase in pheasant, quail, and deer."

The potential for repeating this experience in other parts of Nebraska is encouraging. Latest reports from the University of Nebraska's Conservation and Survey Division place the total number of quarter section systems in the State at close to 16,000. That adds up to a possible 400,000 acres in corners, about half of which could be managed for both livestock protection and wildlife habitat.

Increasing numbers of Nebraskans recognize the potential. From 1971 to 1976, the State planted an average of 2 million trees a year. In 1977, the number of trees planted rose to 3 million.

The Upper Elkhorn Natural Resources District planted 260,000 trees in 1977. About 50 to 60 percent of these went into center-pivot corners or followed the edge of a field.

A strong supporter of these plantings is Glenn H. LeDioyt. "We main-

tained the original shelterbelt of Chinese, or Siberian, elms on the Fountain Farm," he said, "and every year, we added large plantings of more adaptable species. We also fence and maintain all our plantings."

For LeDioyt and his company, the effort pays high dividends in satisfaction. "Last year, a covey of Hungarian partridge showed up strictly on its own in one of the windbreaks," he remembers. "We were as thrilled about it as we were when we calculated that our corn production was over 150 bushels per acre."

Biologist Koerner agrees that the effort is worthwhile. He suggests that another way to enlarge wildlife habitat in places like Fountain Farm is to plant a nesting crop, such as alfalfa, clover, or a mixture of grasses and legumes.

On a statewide basis, Koerner recommends delaying or controlling mowing until about July 15. This avoids harm to nesting cover. Koerner also suggests planting a mixture of taller trees for windbreak protection and low-growing trees or shrubs for wildlife food and escape cover.

Because most wildlife prefer a variety of cover types, Koerner advises landowners to vary their plantings. He recommends low-growing shrubs like amur honeysuckle, American plum, and skunkbush sumac. As intermediate trees, he suggests chokecherry, autumn olive, and Russian olive.

One caution: When corners adjoin road intersections, plantings should be made at least 50 feet diagonally from the center line where the two roads cross. This avoids creating

Trees and grasses planted in center-pivot corners provide food and cover for wildlife.



blind corners for motorists. Plant grasses and legumes nearer the roads.

"The decision to develop center-pivot corners rests with local landowners," Koerner said. "They are the ones who must make the commitment."

For those who want to manage wildlife, assistance is available. Local SCS offices can help with design and layout, as well as with selection of adapted seed mixtures and species of woody plants.

Mr. Butcher was public information officer, SCS, Lincoln, Nebr., and is now public information officer, SCS, Lexington, Ky.

High-Power Habitat

by Tom Michele

An SCS district conservationist in Wisconsin improved a power line path on his property for wildlife habitat.



District Conservationist William Ludwig explains to Trees for Tomorrow students how he manages a power line right-of-way for wildlife.

Thousands of miles of electrical power transmission lines, strung on tall poles and towers, run through the lush, green woods of northern Wisconsin. Many acres of woods must be cleared for the power line rights-of-way, about 12 acres for each mile of a 100-foot-wide path.

William Ludwig, a district conservationist with the Soil Conservation Service, set a good example. He improved the power line path on his property for wildlife habitat.

Ludwig owns 70 acres south of Eagle River in Vilas County. In 1970, a public utility company built a high voltage electric transmission line from Three Lakes to Eagle River on an easement across his property.

"The rights-of-way for power lines are already committed to a particular use, but I wanted to plan for the land's maximum potential," Ludwig said. "I have a lot of woodland, but

some of it is too dense for the kinds of plants to grow that provide food and cover for a variety of wildlife. I took advantage of the power line strips to improve habitat for wildlife."

SCS personnel provide technical assistance to landowners in planning the development or improvement of wildlife habitat including the management of rights-of-way. They help landowners identify plants that provide food and cover for wildlife and help them establish and maintain the plantings.

Soil tests showed that Ludwig needed to add lime to his soil to successfully grow the legumes that many wildlife species prefer. The lime corrects soil acidity and contains calcium which increases plant yield. Ludwig added 9 tons of lime and about 530 pounds of fertilizer per acre to the loamy sand soil on his cleared land under the power line.

The cost to lime, fertilize, and seed the area was about \$170 per acre. The Agricultural Stabilization and Conservation Service provided 50-percent cost sharing for the wildlife habitat improvement project.

Ludwig planted a mixture of grasses and legumes—smooth brome grass, orchard grass, creeping red fescue, ryegrass, alfalfa, birds-foot trefoil, ladino, and white dutch clover.

In addition to the perennial legumes and grasses he plants, Ludwig puts in small plots of buckwheat, sunflowers, rutabagas, rape, winter wheat, rye, and other annuals. He leaves native shrubs—elderberry, dogwood, hazelbrush, pincherry,

juneberry, honeysuckle, blueberry, raspberry, and wild strawberries—growing in clump-like patches to provide food for wildlife and cover for nesting. Weeds provide seed for songbirds.

At different times of the year animals prefer one type of vegetation over another, but some are always attracted to succulent, juicy stems. Ludwig pointed out that planted areas can be mowed occasionally, except in nesting season, to keep plants in a succulent stage of growth and to control the growth of saplings.

The plantings attract songbirds, ruffed grouse, woodcock, cottontail and snowshoe rabbits, and white-tailed deer. There are plenty of signs that deer have fed on alfalfa, ladino clover, birdsfoot trefoil, and white dutch clover. The clearing also provides a place where deer can go to let the breeze blow insects off them.

The Trees for Tomorrow Environmental Center at Eagle River conducts tours and studies of Ludwig's project as part of its environmental education program. "Ludwig teaches soil conservation to our students and tells them about his wildlife habitat improvement activities," said Gene Wirsig, Trees for Tomorrow executive director. "He takes the students out to his land and shows them what he has done."

Mr. Michele is a reporter for the *Rhineland Daily News*, Rhineland, Wis.

Photo courtesy Karl Johansson, Wisconsin Public Service Corporation.

Adapted from an article in the *Rhineland Daily News*, Rhineland, Wis.

Followup on Trees

by Ralph K. Williamson

Conservationists in West Virginia looked at the long-term effects of planting trees to reclaim surface mine sites.



A Siouxland poplar is examined by District Conservationist Quentin Bennett. The poplar, a western tree, showed spectacular growth after 14 years on a West Virginia surface mine site.

About 14 years ago, the West Fork Soil Conservation District, assisted by the Soil Conservation Service, planted trees to help reclaim surface mine sites near Clarksburg, W. Va. In the summer of 1977, SCS went back to the sites to see which species of trees helped stabilize mine spoil and which did not.

SCS employees studied plantings of black locust, red oak, European black alder, American sycamore, Siouxland poplar, baldcypress, and Virginia pine.

At one site, black locust trees planted in 1963 had grown 20 to 25 feet high and averaged 6 inches in

diameter at breast height. The trees had been severely damaged by the locust borer, causing many of the original main stems to break off in the wind. But new shoots grew more stems, and the locust trees were still providing large amounts of leaf litter.

European black alder, a nitrogen-fixing tree, averaged 30 feet tall and measured about 5 inches in diameter after 14 years. However, alders planted on another site in 1964 were only 15 to 25 feet high and 3 inches in diameter. About half of the trees had multiple stems.

Among the pine trees that were planted, Virginia pine proved to be the best adapted. The trees survived in large numbers, grew quickly, and were not affected by insects or disease.

American sycamore and Siouxland poplar had low survival rates for saplings. But both species grew to considerable height and diameter. The American sycamore trees were about 30 feet high and 5 inches in diameter, and the Siouxland poplar grew 40 feet high and 8 to 10 inches in diameter after only 14 years. The poplars were suitable for pulpwood.

The red oak and baldcypress failed to survive. Red oak is one of West Virginia's most prominent forest trees but could not survive on the mine spoil, especially at droughty surface mine sites.

Broomsedge and other grass cover volunteered in some places, but in many areas the soil was too acid for the plants.

Initially, conservationists had expected the planted trees to protect

surface-mined land adequately. The leaf litter from trees in mature forests protects the soil from the explosive impact of raindrops, and the trees' extensive root systems help carry water underground, almost eliminating runoff. Planted trees, however, take almost 10 years to develop closed crown canopies and provide little leaf litter to cushion raindrop impact and reduce erosion.

"Planting trees just wasn't enough to stabilize mine spoil," said John L. Gorman, SCS woodland conservationist in West Virginia. "SCS soon began recommending seeding grasses and legumes for protective cover on surface-mined land."

Today, in West Virginia, tall fescue, birdsfoot trefoil, and sericea lespedeza are planted to provide quick cover after mining and replacement of soil. Mulches are often used to protect the soil until grasses and legumes are established.

A combination of trees—Virginia pine, European black alder, or black locust—and herbaceous cover can be planted where the long-term land use is woodland.

Mr. Williamson is plant materials specialist, SCS, Morgantown, W. Va.

Looking West at Conservation

by Gene Warren

Louisiana farmers and bankers go West to view soil and water conservation activities in other States.



A high point of the tour was a visit to the Hendricks' farm in Woodland, Calif., where the bankers and farmers saw the machine harvest of tomatoes.

at Douglas fir trees being harvested. Oregon also offered tours of a peppermint farm and a peppermint processing plant.

An excursion to California's Sacramento Valley and the Sacramento-San Joaquin Delta climaxed the trip. This area is considered by some to be the most productive land in the world. In Yolo County, tour members saw rice, barley, almonds, English walnuts, and tomatoes growing in well-tended fields. A side trip to an antique farm equipment show at the Hendricks' farm revealed much about the development of California agriculture.

Water management systems in the 481-square-mile delta aroused special interest among the group members. Because of the low elevation, soil saturation on much of the existing cropland in this area must be controlled. This involves pumping water into the Sacramento River and then back onto the land for irrigation. The group also viewed several large water control projects on the river and its tributaries.

Association President Hollier considered the tour one of the most successful in the series. "We saw sights that we had never seen before, such as the apple orchards, the fir trees, and the machine harvest of tomatoes," he noted. "I only wish other States could plan tours similar to ours. We would like to show off Louisiana."

Mr. Warren is public information officer, SCS, Alexandria, La.

To launch a fourth decade of conservation tours, a group of Louisiana bankers and farmers headed West to visit three Pacific Coast States.

Why was this delegation so interested in resource conservation in the West?

"Because it helps to see how people in other parts of the country grow crops and how they view their successes and problems," explained Richard Hollier, Jr., President of the Louisiana Association of Conservation Districts.

"It makes you appreciate the food they grow that we enjoy," he continued. "It also helps Louisianans to do a better job of conservation back home."

Scheduled once every other year, these tours are sponsored by the Louisiana Association of Conservation Districts and the Louisiana Bankers Association. The first tour took place in 1947. Since then, several thousand Louisiana farmers and bankers have visited more than 40 States, as well as Canada and Mexico.

During last year's excursion, nearly 200 Louisianans began their 1-week

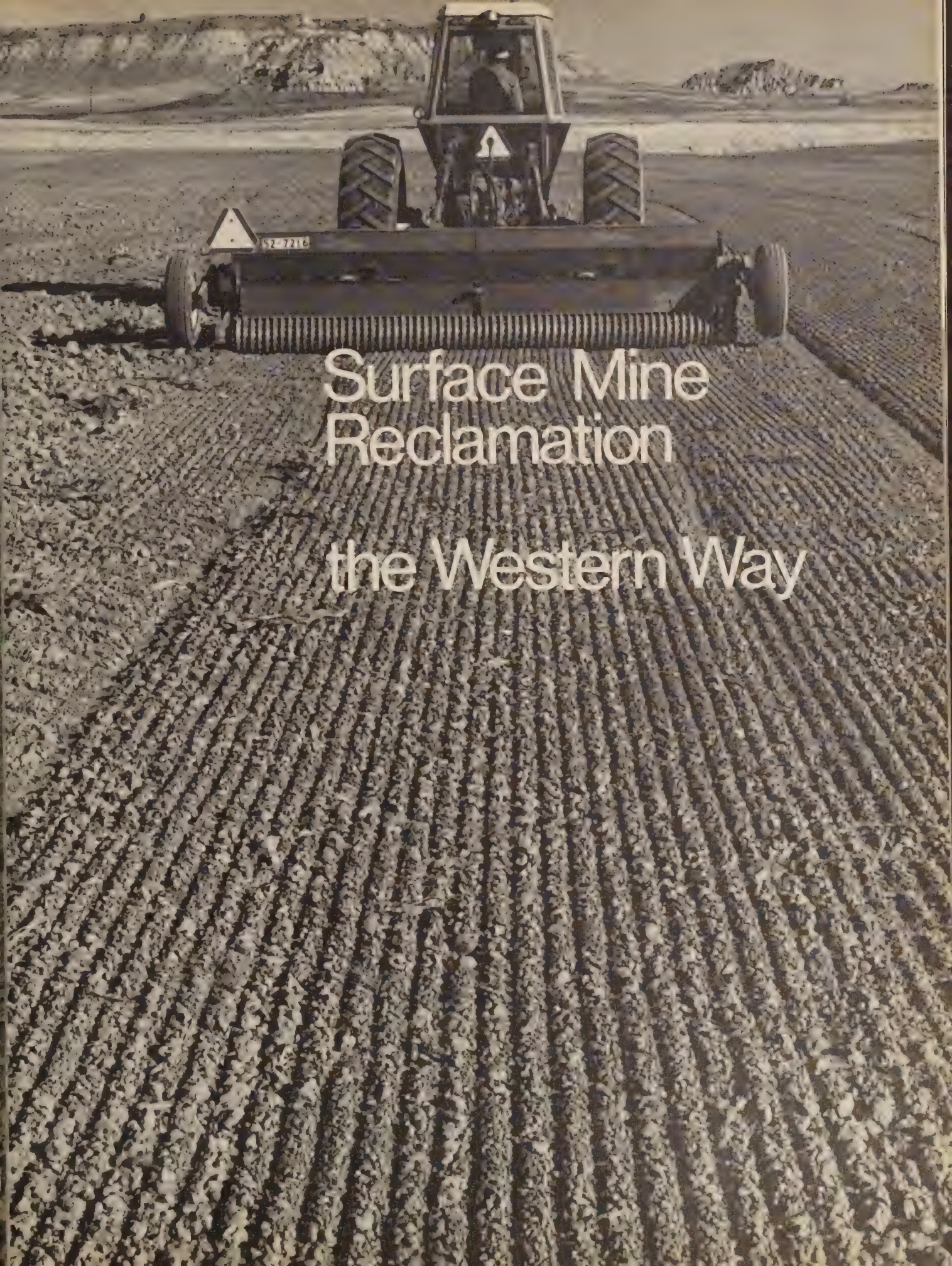
tour in the fruit orchards of Washington, continued through the forests of Oregon, and concluded in California's highly productive Sacramento Valley.

The group started their tour with a bus ride through the scenic Washington countryside to an area near Mount Rainier. There, the visitors had a firsthand look at several water management systems tailored to local needs.

John Edwards, Soil Conservation Service district conservationist at Yakima, explained to the group that rainfall in the area averages only 10 inches per year. Much of the water used for agriculture in the dry valley comes from mountain snowpack. When the snow melts, water is caught in reservoirs and released to farmers through specially designed irrigation systems, such as gravity flow and sprinkler systems.

The group also toured several apple orchards to see how Washington State's No. 1 cash crop is grown, harvested, and distributed.

The next stop on the tour was Portland, Oreg., where the visitors saw a logging operation and looked



Surface Mine Reclamation

the Western Way

Wyoming and Montana have strict surface mine reclamation laws. They help assure that the land will be protected from permanent damage and restored to its premining condition or better.

by Anne Schuhart

Montana Mine Reclaimed for Grazing

The Decker coal mine in southeastern Montana produces more than 10 million tons of subbituminous coal a year. It also demonstrates that careful reclamation is no detriment to high production.

"Decker started producing coal in 1973, a year before the Montana surface mine reclamation law went into effect, but we planned for reclamation and salvaged topsoil from the beginning," said Gary Robbins, soil and revegetation specialist for Peter Kiewit Sons Company, Inc., the operating partner in the Decker Coal Company.

"We are reclaiming the land with native and adapted vegetation for grazing—that's what it was used for before. Everything we do in reclamation, such as grading and selecting seed, is geared toward that use.

"We follow three basic steps," Robbins explained. "First, we salvage the topsoil. We use soil surveys and laboratory analyses to identify all the soil material suitable for plant growth. Then we scrape it off and lay it back on a regraded area or stock-

Above, drag lines as long as football fields scoop out 70 cubic yards of overburden at a time and place it as fill in the previous cut. Right, after the cut is filled and graded, the topsoil is replaced and a seedbed is prepared.



pile it. Next we fill in the mine cut and regrade the fill to proper contours for good drainage."

The Decker mine is a series of horseshoe-shaped cuts. As the overburden is scooped out to expose the seam of coal in one cut, it is dumped as fill into the previous cut. The fill is shaped to approximate the original rolling landscape.

"Finally," said Robbins, "we replace the topsoil, prepare a seedbed, and plant."

Montana law requires the mining company to restore the land to its previous condition or better. The vegetation that is seeded must be capable of supporting domestic livestock and wildlife and capable of sustaining production at a rate equal to that before mining. Generally, native species are used.

"We reseed with a mixture mainly of wheatgrasses," said Robbins. "The subsoil here is high in sodium, but we select species adapted to the area and suited to our end purpose of grazing even though the species may not be salt tolerant. Many salt-

tolerant plants are not that good for grazing."

The stockpiled topsoil also contains plant litter—seeds and roots. In addition to the seeded plants, some "volunteer" native species—such as sideoats and blue grama—regenerate directly from the litter when the topsoil is spread back over a graded area.

After the area is seeded, it is sprayed with 1 ton of wood mulch per acre. "The mulch is more to prevent soil crusting than erosion," Robbins said. "There is very little wind here and rainfall is less than 12 inches a year so erosion is not a big problem. The rain that does fall is diverted away from the mine, and water in the mine flows into a sediment basin.

"We control weeds by mowing after the first year's growth," he continued. "We don't use herbicides to kill the weeds because the herbicides would also kill some broadleaf species of legumes and shrubs we've included with the grasses in our planting mixture."

"The Soil Conservation Service assists us in all parts of reclamation," said Dwight Layton, head of reclamation for Decker Coal Company. "SCS specialists make range inventories and soil surveys for us, help in planning, and recommend plant materials."

The plant materials center operated by SCS in Bridger, Mont., has used the Decker mine for extensive field plantings of 'Rosana' western wheatgrass, 'Critana' thickspike wheatgrass, and 'Wytana' fourwing saltbush and for trial plantings of white prairie clover. USDA's Forest Service, Montana State University, and others also use the mine for trial plantings and reclamation research.

Provisions for wildlife are made throughout the Decker operation. Cooperating with the U.S. Fish and Wildlife Service and the Montana Department of Fish and Game, for example, the company constructed a dike on land between the Decker Mine and the Tongue River Reservoir. Beginning this spring, mine discharge water that has been proven safe in

Wood mulch is sprayed over newly seeded areas at a rate of 1 ton per acre to prevent soil crusting on the surface and to protect against erosion.



Dwight Layton, head of reclamation for Decker Coal Company, checks natural regeneration on a reclaimed bank. Although the bank was seeded, native seeds that were dormant while the topsoil was stockpiled are also taking root.



tests will be released behind the dike to maintain a constant shallow water area for spawning pike and nesting geese. Gates in the dike connect the marsh to the reservoir.

"We continuously monitor the wildlife and what effect mining is having on it," said Layton. "For instance, we found that for some reason reclaimed areas attract a large number of rodents. To keep the population from getting out of hand, we set up bird boxes to attract American kestrels, or sparrow hawks, which eat insects and small mammals."

"We also have a large population of antelope and deer," Robbins added. "We don't do anything specifically to attract them, but they seem to know they're safe from hunters here."

As a followup to reclamation at the Decker mine, the growth of seeded plants is checked at least once a year.

The Decker company also maintains a series of wells within reclaimed areas to see if ground water will flow into the spoil and if

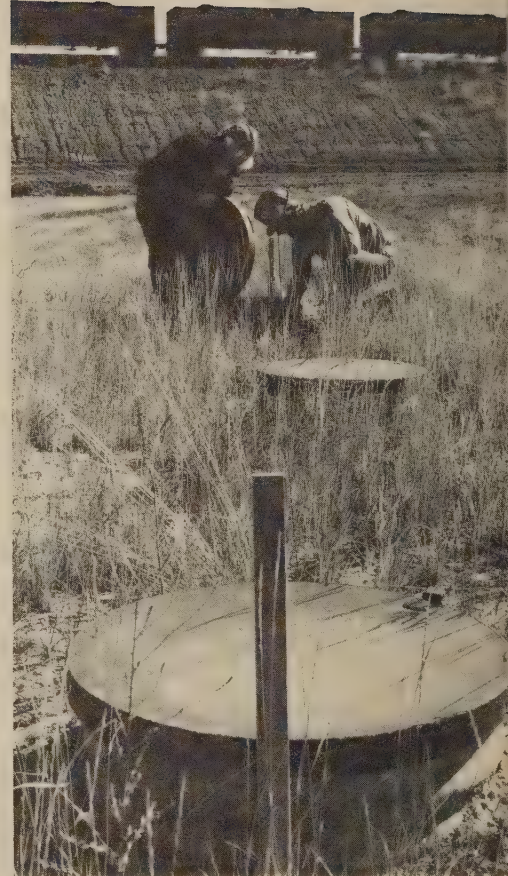
the spoil will act as an aquifer to hold the water. The wells also are used to monitor the quality of ground water.

"Our mining permit will cover about 2,000 acres," said Layton. "Right now, about 500 acres have been disturbed and nearly 200 acres of that are reclaimed. We're catching up, but over the life of the mine, there will always be about 100 acres disturbed for current operations."

Reclamation is so interwoven with mining operations at the Decker company that all phases—from stockpiling topsoil to monitoring reseeded vegetation—go on concurrently as successive pits are opened and filled.

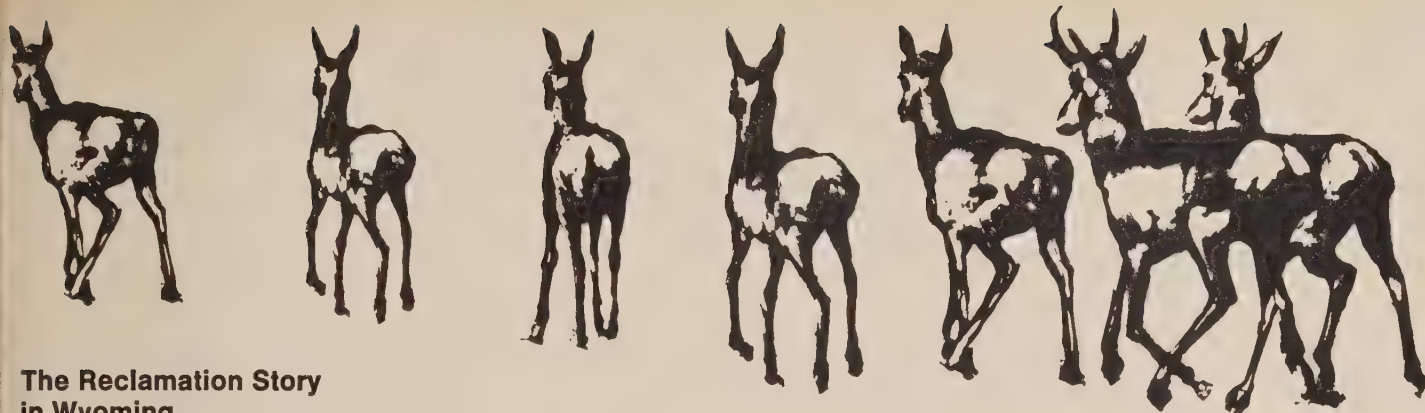
When the coal is finally exhausted, reclamation at the Decker mine will not be completed until topsoil is spread where the headquarters now stands, the last acre is seeded and mulched, and the range is returned to grazing livestock.

At right, Dwight Layton (left) and Gary Robbins check a series of monitoring wells at the edge of a reclaimed area.



Bird houses attract American kestrels which control the rodent population on reclaimed areas. Far right, discharge water from the Decker mine will be used to maintain a shallow water area behind a new dike as a spawning area for pike and a nesting area for geese.





The Reclamation Story in Wyoming

The demand for coal has grown rapidly in the last few years, but Wyoming's surface mine reclamation laws have kept pace with production.

"Coal has been mined in north-eastern Wyoming since the 1890's, when the railroad came through, and it's been surface mined since the 1940's," said Francis A. Smith, Soil Conservation Service district conservationist at Sheridan.

"Wyoming passed its first surface mine reclamation act in 1969, and in 1973, the legislature passed another stricter law partly because of the number of new pits being dug," he continued.

"Basically, the 1973 law says that all surface-mined land will be reclaimed to a condition capable of supporting its highest use prior to mining. For example, if the land was always used for range, it can be reclaimed for range; but if it was ever used for crops or hay, it must be reclaimed so that it could again be used for crops or hay.

"The law also says that in applying for a mining permit, mining com-

panies may have their reclamation plan reviewed by the local conservation district before submitting it to the State Department of Environmental Quality," Smith explained. "The services of the district are available to the mining companies just as they are to local farmers and ranchers."

In many conservation districts, SCS helps the mining companies develop their reclamation plans. The first step is making a standard soil survey of the area leased for mining. SCS soil scientists study soil profiles at sample sites to a depth of about 60 inches.

"The survey includes descriptions of the soil series and descriptions of soil associations and complexes," said Smith.

A reclamation plan must include an estimate of the amount of topsoil needed to cover disturbed land after mining plus 25 percent of that to allow for compaction. If the land had been irrigated before mining, the company must cover the fill with 30 inches of topsoil; if it was dryfarmed cropland or pasture, 24 inches; and

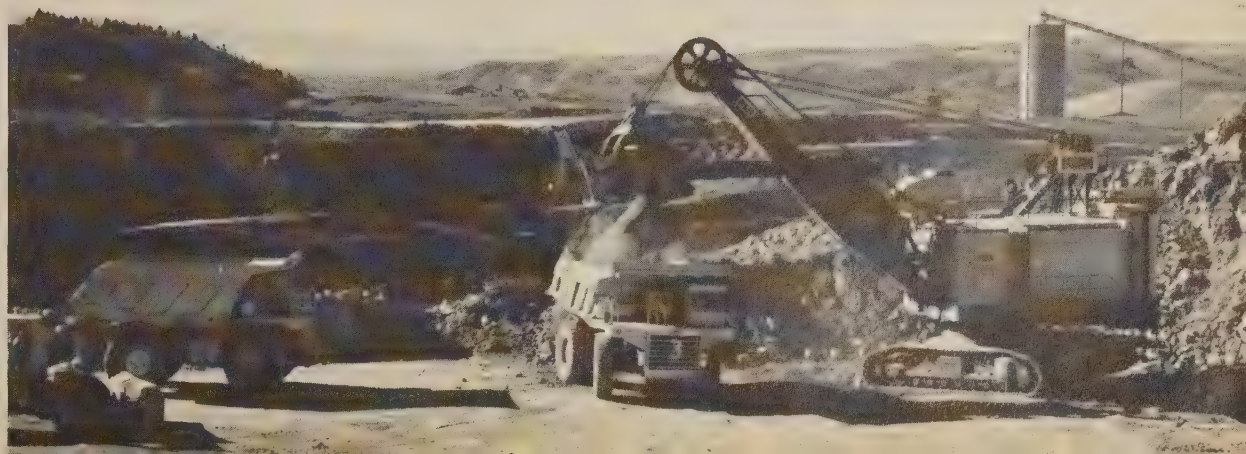
if it was range or woodland, 18 to 20 inches.

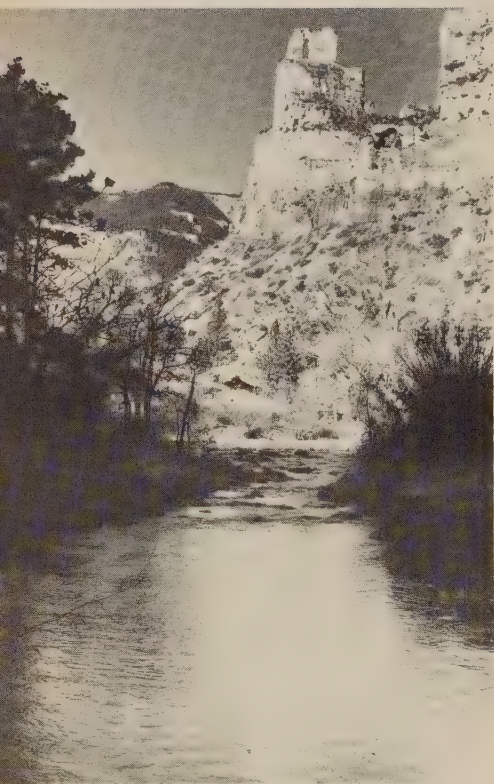
"If requested, during the planning process we make a complete inventory of what's on the land before mining," said Smith. "We map the range sites, determine their condition, and analyze the vegetation. We also suggest initial stocking rates." The information will be used not only to plan reclamation but also after reclamation to determine if the sites were restored to equal or better carrying capacity.

Based on the inventory, SCS recommends grades for leveling, specifications for seeding, location of fences, planned grazing systems, stockwater facilities, and other conservation work for reclaiming the land and managing it afterwards.

The recommendations are specific. For example, recommendations SCS makes for proper grazing use by cattle include the key species to be grazed, when and how much they should be grazed, the leaf length needed to begin grazing, the minimum stubble height during grazing,

Shovels and trucks are used instead of drag lines to remove the overburden at the Big Horn coal mine north of Sheridan, Wyo. This allows more precise placement of the overburden as fill in other cuts.





A mining company's permit application must include studies of surface and subsurface water and plans to protect water quality.

and the minimum regrowth needed before a killing frost.

"The coal company must have the soils information before it can draw up an engineering plan for mining," Smith said. When the range inventory and yardage computation are complete, SCS and the mining company work on completing the reclamation and engineering plans.

In the permit application, the mining company must also include a wildlife inventory, lists of adjacent surface and mineral owners, a description of historical and present land use, studies of surface and subsurface water, a list of adjudicated water rights, and numerous other lists and maps—all in detail.

For example, the baseline wildlife inventories must include the kind and approximate populations of all wildlife in the region, from mule deer to garter snakes; which animals live on the permit area, use it for hunting, migrate through it, and winter on it; and measures the company will take to mitigate the effect of mining disturbance on wildlife. There is also a

continuous wildlife monitoring program throughout all stages of mine development.

Finally the coal mining company must post bond for the estimated cost of the reclamation work to guarantee that all the requirements will be met.

Wyoming's strict law and permit requirements do not discourage coal mining in the State—mining is too profitable a venture. They do, however, give the State firm control over the condition in which the land will be left when the coal is gone and the mining companies move on to other deposits.



Paul Lupcho, SCS soil scientist at Sheridan, Wyo., takes a soil sample at a site leased for mining by the Black Mountain Coal Company. Soil surveys are the basis for mine reclamation plans.

Uranium Mines: A Special Reclamation Problem

One of the richest uranium deposits in the world is in the Shirley Basin, on the high plains southwest of Casper, Wyo.

Reclaiming uranium mines is different from reclaiming coal mines. The goal is the same—to return the land to its previous condition or better—but uranium and the way it is mined present special problems.

"It takes a heck of a hole just to get a little uranium out," explained Charles McAfee, Soil Conservation Service range conservationist for Wyoming. "It can take a company 2 years to get the overburden off before they can even start mining."

A pit operated by the Lucky Mc Uranium Corporation covers 403 acres. The company had to dig down 382 feet to reach a 6- to 22-inch layer of uranium ore.

Shovels and trucks remove the overburden. Then, using a geiger counter, one man surveys and stakes out exactly where backhoes should scrape for the thin layer of ore.

Coal companies have to remove about 4 to 5 tons of overburden per

ton of coal; uranium companies have to remove 71 tons of overburden per ton of uranium ore. The ore is then processed into uranium oxide, or "yellow cake." Each ton of ore produces only about 4 pounds of yellow cake.

"This pit produces about 2 million pounds of yellow cake a year—10 percent of all the uranium oxide produced in the country," according to an official at the mine. "It's used to generate power, but it has to be 'enriched,' or further refined, first."

Many surface mines for coal are a series of cuts; the overburden from one cut is used to fill in the previous cut. But in a uranium mine, the entire pit is opened at one time and the spoil is piled around the top of the pit.

"Erosion is a problem on the spoil piles because they are 200 feet high and the outslopes are long," said McAfee. "Gully erosion caused by compacted snowdrifts melting in the spring is especially bad. The company plans to try using fences to disperse the snow or an aspen fiber

blanket on the slopes to slow runoff enough for plants to take hold.

"Erosion also is aggravated because seeding the spoil has to be delayed. The miners have trouble in the pit with landslides because they are mining in an aquifer. They have to haul the slide material out of the pit and dump it on the spoil. Topsoil isn't spread and seed isn't planted until the miners have finished building up the spoil in a particular area. Even so, the spoil covers 690 acres and more than 500 acres of that has been reclaimed."

After all the uranium has been extracted, overburden from a new pit will be used as fill. The disturbed area will then be graded, covered with topsoil, and seeded.

"The company has already used a number of plant species for seeding—wheatgrasses, yellowblossom sweetclover, fourwing saltbush, and Indian ricegrass—depending on the availability of seed," said Lon Young, SCS agronomist for Wyoming.

To help select vegetation suitable for stabilizing mine spoil, SCS



Uranium mining in the Shirley Basin means digging out as much as 400 feet of overburden to expose a 6-inch layer of uranium ore.

planted test plots of species developed at the plant materials center operated by SCS at Bridger, Mont.

"The biggest problem with our plant materials is that they are nice and green and the antelope come in and nibble them right to the ground," said Young. "Fencing to exclude animals may be needed until the plantings are well established."

"SCS also recommends that we work with a prepared seedbed on the spoil," a company spokesman said. "After we spread the topsoil, we add 160 pounds of 40-40-0 fertilizer per acre, disk and harrow the soil, and seed barley, which establishes itself much faster than native plants. We mow the barley after the first year's growth and seed native plants directly into the stubble.

"We prefer using a cover crop instead of mulch because it gives better, deeper protection and it improves the soil at the same time."

But even the best seedbed preparation does not guarantee success. "The average precipitation is only 11 inches a year, and it falls mostly in

April through June," said Young. "Last June was very dry, and that makes quite a difference here because June is when the cool-season grasses put out their best growth. The dry weather really hurt the seeding.

"We are working with a very fragile environment," he continued. "We are at a high elevation; the growing season is short and the winters are

harsh; rainfall is low but intense. The plants that can grow here do not provide thick cover. Even under the best conditions, the vegetation isn't much."

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.



Fencing to exclude animals may be needed in reclaimed areas until plants are well established.

Woodlands: A Growing Resource

by Howard W. Beery

An Ohio soil and water conservation district campaigns for improved woodlands to control erosion, provide wildlife cover, and increase farm income.

Landowners are taking a close look at woodland management in Carroll County, Ohio, and with good reason. Almost half of the county is woodland—more than 113,000 acres are in oak, maple, ash, and red and white pine.

The Carroll County Soil and Water Conservation District (SWCD) board of supervisors recognizes these woodlands as a valuable resource and is actively promoting good woodland management.

"With a complete woodland improvement program in the county," said SWCD Chairman Art Rummell, "we could produce an additional 23 million board feet of lumber each year. That would be worth about \$1.7 million a year."

One source of assistance available to landowners, according to Rummell, is the Ohio Department of Natural Resources. The department supplies service foresters who will make a site visit at the landowner's request and recommend woodland management practices.

"A woods is like a carrot patch," said Cloyce Riddle, service forester for Carroll and three other counties. "It needs to be tended and thinned so the owner can get big, high-quality trees."

On a typical site visit, Riddle walks through the woods with the landowner to see what the woods can produce and to determine what the owner wants from the land.

"On a site visit we make an inventory of the trees and then decide about thinning and harvesting them," explained Riddle. "We also make recommendations for removing dead

trees and vines and killing unwanted vegetation."

The service forester helps the landowner develop a harvest plan which includes judging board feet and marking harvestable trees.

Another source of assistance for landowners in Carroll County is the Soil Conservation Service. The SCS field office staff in Carrollton, working through the SWCD, helps district cooperators select the kinds of trees that will grow best on their land. Using information gathered in the soil survey, the staff determines the capability of a particular type of soil for wood production potential.

"Soils information is like money in the bank when a landowner plants trees," said Rummell. "Why waste time, effort, and money planting the wrong kind of trees when you can plant those best suited to the soils you have?"

SCS also helps the landowner with plans to control erosion during woodland harvesting and to minimize loss of soil nutrients. Plans may incorporate such practices as building logging roads along the contour; keeping road grades gentle—3 to 10 percent; keeping roads away from steep hillsides, especially on soils subject to slippage; using bridges and culverts to cross waterways; outsloping road surfaces to prevent water collection; and installing waterbars to carry water off roads. Other practices include installing small diversions and seeding grass, such as tall fescue, on temporary logging roads to reduce erosion.

Mr. Beery is district conservationist, SCS, Carrollton, Ohio.



A woodland of mixed hardwoods is typical of those in Carroll County, Ohio.

Trees and Shrubs, Where Are You?

by Brad Anseth

Mitosis, the process of cell division in plant or animal growth, has a new meaning in Montana. MITOSIS stands for the Montana Interagency Tree or Shrub Improvement Study.

MITOSIS grew out of a recommendation by Harold Hunter, SCS woodland conservationist, and Robert Lohmiller, SCS plant materials specialist, that the plant materials center (PMC) operated by SCS in Bridger, Mont., expand its activities to include trees and shrubs. They also recommended that the PMC work with other agencies to improve woody plants and set up a seed certification process for woody plants.

At the end of 1975, as a result of these recommendations, the Division of Forestry of the Montana Department of Natural Resources and Conservation signed an agreement with USDA's Forest Service and Soil Conservation Service to combine programs and resources. Their aim was to speed up the selection of improved trees and shrubs for conservation purposes, such as field and farmstead windbreaks; wildlife habitat improvement; mined land reclamation; and revegetating transportation and utility corridors, logging roads, and greenbelts. Plant development of commercial timber species was not an objective of the program.

Under the agreement, the three agencies developed a project outline and schedule. Three of the four major projects are well underway.

Project One

Under project one, SCS employees located superior tree and shrub species in windbreaks throughout Mon-

Three agencies are working together to develop new and improved varieties of trees and shrubs for conservation activities in Montana.

tana. They gave Harold Hunter—MITOSIS chairman—the locations, and Hunter arranged for representatives from the other agencies participating in MITOSIS to make final species selections.

The seeds from the superior shrubs and trees were collected by 4-H groups under the supervision of SCS personnel.

Project Two

With the seed collected, project two began. The performance of the improved plants will be compared to that of standard plant materials.

"We were so sure of the superiority of some of the species we collected," Hunter explained, "that the State forest tree nursery went into immediate production."

Some of the seed believed to be superior was labeled and is being grown to seedling size by the State Division of Forestry's Forest Tree Nursery. The seedlings will then be sent to the plant materials center in Bridger where they will be used in the regular plant materials evaluation program. Through this program the superiority of the plant material will be established.

Project Three

Project three deals with a problem of establishing conifers.

"Because conifers are green year-round, long lived, and relatively disease free when compared to other trees, I felt they should be used more than they are now," said Hunter. "However, landowners were getting discouraged because conifers are so hard to establish."

Under the MITOSIS agreement, the Division of Forestry grows the trees for project three and SCS tests and evaluates the growth through the plant materials program as in project two.

Project Four

Project four is a last resort, according to Lohmiller. "Only if projects one and two don't produce, do we go to project four. If plants can't be found to do what's necessary, then new plants will be developed to do the job under the MITOSIS project," explained Lohmiller.

"MITOSIS also hopes to insure that superior seed sources are protected," he continued. This may be done through formal agreements with current owners of superior sources or by reestablishing the sources at the forest tree nursery, plant materials center, Forest Service nursery or seed orchard, or Montana Agricultural Experiment Station.

Other Projects

The MITOSIS group is working on two other projects. "There is no seed certification for woody plants in Montana," Hunter said. "MITOSIS is going to work through the Montana Seed Growers Association, the State's grass and seed certification organization, to set some standards for woody plant certification."

MITOSIS is also cooperating with the Forestry Committee of the Great Plains Agricultural Council, a multi-State group dedicated to improving agriculture in the Great Plains. The committee identified a need to improve Rocky Mountain juniper and

Eastern red cedar for conservation purposes in the Great Plains after it determined that these were the species most technicians felt had high priority for study.

Four acres of the plant materials center have been set aside to grow and evaluate juniper from Montana and Wyoming accessions. George Howe of the Forest Service is coordinating the activities of the council and MITOSIS.

"MITOSIS is not intended to be an exclusive three-agency program," Hunter pointed out. "Any organization in or serving Montana that can identify mutual benefits is welcome to join."

"Private nurseries will probably become more and more involved as the program continues," said Lohmiller. "MITOSIS is designed to identify outstanding woody plants and give them to the Division of Forestry's nursery to grow until there is a demand so the private nurseries can grow and market them economically."

Richard A. Cunningham, formerly with the Forest Service and now with the Science and Education Administration, played an active role in the development of MITOSIS. He summed up the project when he said, "The progress of MITOSIS has been outstanding and shows promise of becoming a model for effective inter-agency cooperation in an action program."

Mr. Anseth is public information officer,
SCS, Bozeman, Mont.



Under the MITOSIS project, seeds are collected from superior tree and shrub species in windbreaks.

Soil Maps on Trail of Bog Turtle

Soil maps help locate the habitat of an endangered species in Maryland.

by Nadine E. Pitts

When Marylanders became concerned about one of the State's endangered species of wildlife, a biologist devised a novel approach to mapping its habitat.

Gary J. Taylor, nongame and endangered species program manager for the Maryland Wildlife Administration, conceived the idea of using soil survey maps to locate actual and potential habitat of the bog turtle, *Clemmys muhlenbergi*.

"I remembered from a soils class at college that soil surveys have good base maps to scale," said Taylor. "The surveys turned out to be just what I needed."

Taylor asked the Baltimore County Soil Conservation District and the Soil Conservation Service for help. Martin Gordon, SCS district conservationist, now retired, provided Taylor with county soil maps and assisted him in

interpreting them.

"Using the soil maps to plan the survey was the most efficient method available to us," said Taylor.

A limited budget, the secretive nature of the bog turtle, and its disjunctive pattern of distribution made the habitat survey difficult. At the time the survey was undertaken, bog turtle habitat had been reported in four Maryland counties—Baltimore, Carroll, Cecil, and Harford—a 1,861-square-mile area. Because of its popularity as a pet and the scattered distribution of the scarce habitat, the turtle had been placed on the State's endangered species list in 1973.

Taylor and Gordon examined the soil maps and pinpointed soil types having properties that support the habitat favored by the turtle. It prefers spring-fed bogs, seepages, or wet meadows where there is a con-

stant source of cool water in trickles or rivulets through September. The turtles use the rivulets as travel lanes through moderate to dense vegetation such as skunk cabbage, rice cutgrass, and jewelweed. Turtle colonies have been found in several soil types, all of which occur in lowland areas paralleling streams.

Following leads provided by the maps, the field team investigated potential sites plotted on soil survey sheets. When they began the survey in Baltimore County, they knew of only seven colonies of turtles. After the survey, they had discovered 24 new colonies and 183 potential sites.

The team was equally successful in using the soil maps for Carroll County. There, they knew of only five colonies. After studying soil survey sheets for the northeastern section of the county, they found 51 new



Dark areas on soil survey map indicate soil types which might support habitat favored by the turtle.



At left, the turtle favors spring-fed bogs, seepages, or wet meadows where there is a constant source of cool water. At right, the bog turtle was placed on Maryland's endangered species list in 1973.

—courtesy, Maryland Wildlife Administration.

Meetings:

May

- | | |
|-------|--|
| 1-5 | League of Women Voters, Cincinnati, Ohio |
| 6-7 | Sierra Club, San Francisco, Calif. |
| 6-9 | National Forest Products Association, Washington, D.C. |
| 17-19 | Boy Scouts of America, Phoenix, Ariz. |
| 17-19 | Southern Forestry Conference, Savannah, Ga. |

June

- | | |
|-------|--|
| 4-8 | National Council of State Garden Clubs, Inc., Detroit, Mich. |
| 4-9 | General Federation of Women's Clubs, Phoenix, Ariz. |
| 6-12 | Outdoor Writers Association of America, Virginia Beach, Va. |
| 19-27 | Soil Science Congress, Edmonton, Alberta, Canada |
| 24-29 | National Environmental Health Association, Snowmass, Colo. |
| 26-28 | American Plywood Association, Portland, Oreg. |
| 25-28 | National Watershed Congress, Toronto, Ontario, Canada |
| 25-29 | American Seed Trade Association, Inc., Kansas City, Mo. |
| 25-30 | American Water Works Association, Atlantic City, N.J. |
| 26-30 | Air Pollution Control Association, Houston, Tex. |
| 27-30 | American Society of Agricultural Engineers, Logan, Utah |

July

- | | |
|-----------|---|
| 8-12 | National Association of Counties, Atlanta, Ga. |
| 15-19 | American Association of Nurserymen's Convention, New Orleans, La. |
| 19-21 | Izaak Walton League of America, Inc., French Lick, Ind. |
| 23-27 | National Federation of Business and Professional Women's Clubs, Inc., San Juan, Puerto Rico |
| 30-Aug. 2 | Soil Conservation Society of America, Denver, Colo. |

colonies and located 115 potential sites. Data for the other counties have not yet been analyzed.

Neither mowing nor moderate grazing seems to affect the bog turtles adversely, Taylor and his colleagues found. Moderate grazing actually appeared to improve conditions by creating pockets of water and softer soil for burrowing.

"Owners of the turtle sites are responding favorably to preserving the turtle's habitat," said Rick Dills, current SCS district conservationist in Baltimore County. Taylor agreed, explaining that most owners are grateful to learn the importance of their land for the species.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.



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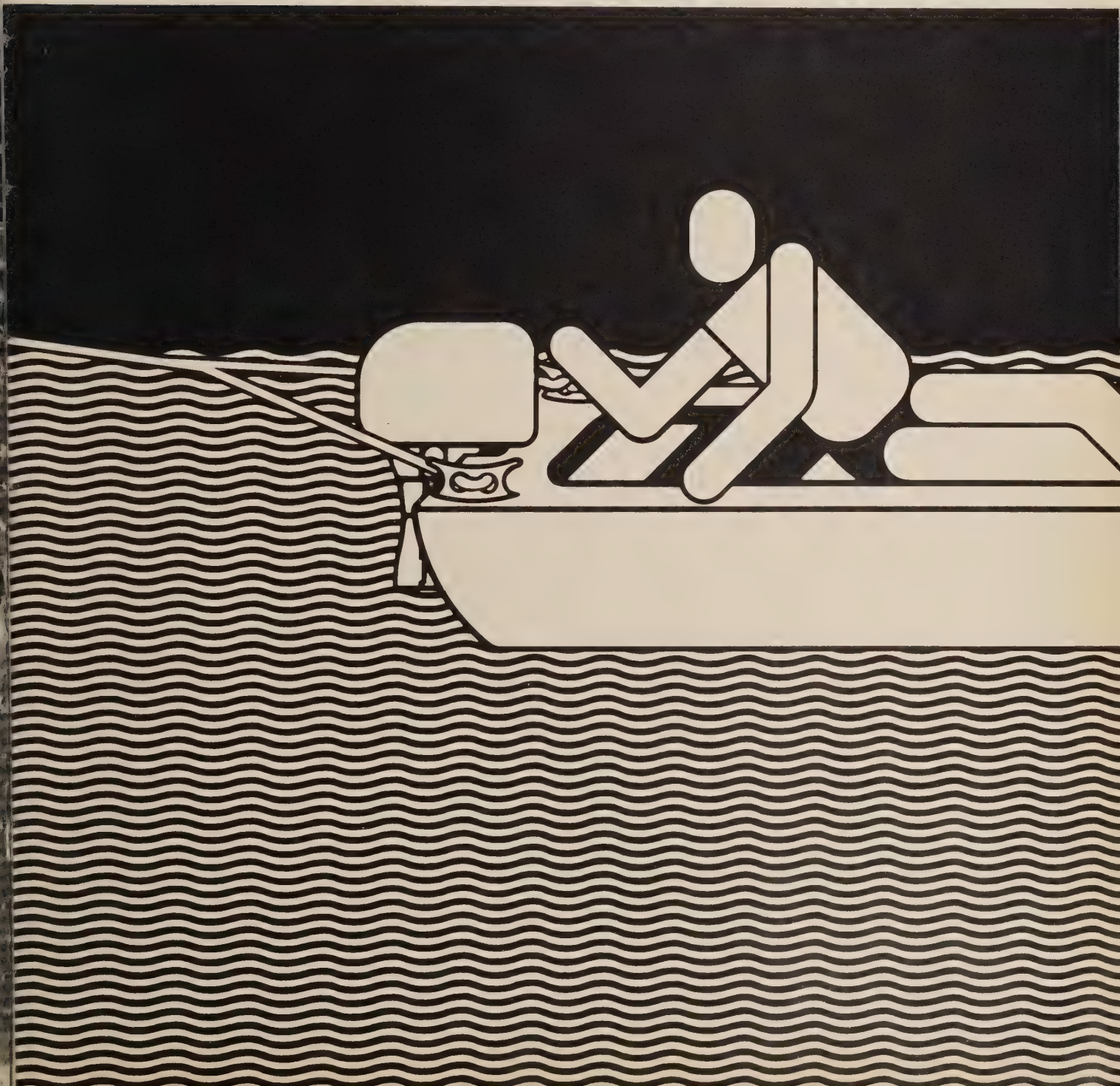


Soil Conservation

June 1978

U.S. Department of Agriculture

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From the Administrator

Recreation Within Reach

In the past few years, the demand for recreational opportunities—especially outdoors and within reach of population centers—has grown rapidly and shows no sign of letting up. SCS and conservation districts are helping to meet this growing demand.

For example, many small watershed projects include public facilities for swimming, boating, fishing, picnicking, and camping. Some offer game courts, playgrounds, and trails for hiking, biking, and horseback riding—all in addition to providing flood protection.

Recreation is an important feature of most Resource Conservation and Development areas—complete parks with water for fishing, boating, and swimming; miniparks alongside quiet rivers; or family picnic areas. Recreation adds an economic spark to the community as well as more enjoyment.

Satisfying people's wants for recreation is a worthy land use, just as much as producing crops, forage, or timber. It can be the primary use of certain areas, but it is more likely to be part of a multiple-use scheme for land and water.

Nearly three-fourths of the land in the United States is privately owned. Landowners thus can help supply recreation to meet the needs of a growing population. By blending multiple uses of land and water and applying the right kind of conservation practices, landowners can gain important commercial and personal recreation benefits:

- Farm ponds can provide excellent swimming and fishing.
- Fish farms can include pay lakes for public fishing.
- Wetlands properly preserved and managed attract a wide variety of game and nongame wildlife.
- Streambank stabilization improves fishing by improving water quality.
- Windbreaks, stripcropping, patterned brush control, woodland management, and erosion control plantings furnish food and cover for wildlife and improve water quality.
- Soil and water conservation beautifies the landscape for sports enthusiasts, nature lovers, and front porch rockers alike.

By thinking of multiple use when we help land users plan conservation practices, SCS and districts can offer priceless recreation benefits—at less additional cost.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Soil Conservation

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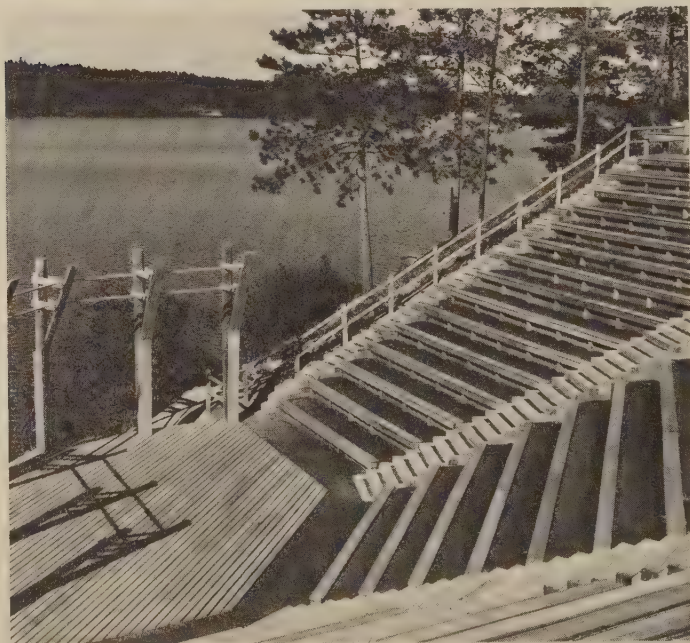
A county park in Michigan gets a new look with erosion control measures and improved facilities.

Pride in a Park Started with Erosion Control

As part of an RC&D measure, SCS helped control erosion and improve facilities at the Oscoda County Park on the Au Sable River in Michigan. A timbered stairway was built to replace an eroding footpath, and a rock chute was constructed in the path of concentrated runoff to retard gullying.



SCS provided assistance in planning the community's modern amphitheater situated on a hill overlooking the river. High school band concerts and many other community events are held in the new outdoor theater.



"Attendance at the Oscoda County Park is above previous years, a natural resource is protected and being used wisely, and Oscoda County's 4,726 residents are now proud of their park," said Barney Kinney, Chairman of the Oscoda Park Commission.

This was not always the case. This beautiful park on the Au Sable River near Mio, Mich., was deteriorating. Campers climbing the high, steep bank along the river were creating gullies, and minimal camping and day-use facilities were overused and rundown. As a result, people were going elsewhere for outdoor recreation.

When the Huron Pines Resource Conservation and Development measure was authorized in 1972, the Oscoda County Park and Recreation

Commission submitted a proposal to improve the park and control erosion. The proposal was approved and given a high priority by the county and RC&D councils. The Soil Conservation Service was called in for technical assistance.

SCS worked with the Park Commission and the Oscoda County Soil Conservation District (SCD) to solve erosion problems. Plans for controlling erosion on the 54-acre park included:

- Critical area seeding of about 2 acres with a seeding mixture of Kentucky 31 tall fescue, red fescue, perennial rye, and Kentucky bluegrass.
- Recreation walkways which control gully erosion and provide access to the river.
- About 3,400 feet of rail fencing, used to direct people to the protected walkways.
- Two rock chutes constructed in areas of concentrated runoff where vegetation could not control erosion.
- One grassed waterway, 500 feet long.

Money for the materials was provided through the RC&D program and the county installed the improvements, using its own equipment and employees from a Title X Program administered by the Oscoda County SCD.

"As the work was completed and the scars of erosion were healed, local people regained pride and interest in the park," explained Barney Kinney.

One of the major events held annually at the park is the Great Lakes Forestry Exposition. The expo-

sition includes forestry and sawmill equipment demonstrations, exhibits, special entertainment, and a log birling contest. During the exposition, the park is packed with campers, exhibitors, and other tourists.

Before the RC&D measure, a hill overlooking the river was used as an amphitheater for entertainment and as a vantage point for watching the birling contest. Because of overuse, it was subject to erosion. The community wanted to build a modern amphitheater that would seat 800 people but did not have the funds to do it. Local groups put on a fund drive and hired an architect to provide a design. Aided by a grant from the Michigan Bicentennial Commission, the community built the outdoor theater with help from Comprehensive Employment and Training Act employees. SCS provided technical assistance with site planning.

SCS also assisted with developing plans for a modern restroom facility that was needed to improve the park. The restrooms were built and financed through a Title X Program administered by the Upper Great Lakes Regional Commission.

In the future, the community plans to relocate and expand the campgrounds and improve the day-use area. Its long-term plans are assuring that this valuable natural resource will be protected.

Mr. Church was RC&D coordinator, SCS, Grayling, Mich., and is now resource conservationist, SCS, East Lansing, Mich.



Pedestrian traffic to and from the river bared the sloping banks, leaving them vulnerable to erosion.

Recreation Times Two

In North Dakota, two watershed projects were planned to provide flood protection and recreation, too.

Silver Lake, A Shining Example

by Myron P. Senechal
and Elmer R. Umland

"The Silver Lake recreation area is the nicest and best kept park that we have been in—and we have been in every State in the Union," said Ralph and Loa Campbell of Niagara Falls, N.Y., during their visit last summer. But Silver Lake in the Tewaukon watershed near Rutland, N. Dak., was not always listed in guides to the Nation's parks and campgrounds.

The construction of a Work Projects Administration dam in the 1930's raised the water level in the lake. A small recreation area with a boat dock and beach was developed, but it slowly deteriorated.

The dam was repaired several times through the years and in 1955 a severe summer storm caused damages in the watershed totaling more than \$300,000. This and the previous problems with flooding and erosion prompted the Sargent County Water Conservation and Flood Control District, the Wild Rice Soil Conservation District (SCD), and the Marshall County Conservation District in South Dakota to join in sponsoring a flood control project plan for the watershed. Under the Public Law 566 small watershed program, the Soil Conservation Service helped plan and design the new diversion and spillway.

Local people, some remembering the recreation facilities that had been around the lake in the 1930's, organized a committee to investigate the possibility of developing new recreation facilities as part of the project. Financial contributions from people in the community, equipment and labor donated by the Sargent County

commissioners and the Wild Rice SCD, tractors and trucks donated by farmers, and services offered by individuals and organizations demonstrated the interest and enthusiasm in the project.

The county commissioners formed the Sargent County Park Board to handle the funds and direct the recreation area project.

Under Public Law 566, SCS designed the recreation facilities and provided 50 percent of the land cost. The work plan for the Tewaukon watershed project was modified to include the recreation area, and construction began in the summer of 1967. The recreation area covers close to 200 acres—about equal amounts of land and water.

The North Dakota Game and Fish Department shared part of the cost of purchasing the land on the northwest side of the lake with the Sargent County Water Management Board. The Sargent County Park Board also shared part of the land cost.

The recreation area includes a beach for swimmers, a boat ramp, a softball diamond, picnic shelters and tables, outdoor grills, two wells, sanitary facilities, and more than 10 acres of tree plantings. There are 18 horseshoe courts used by leagues throughout the summer.

SCS also helped plan areas of the park for wildlife habitat.

The Wild Rice SCD hosts a conservation and environmental tour of the recreation area every year for all Sargent County seventh grade students.

In the summer, the recreation area

employs two people full time. "This is my pride and joy—keeping up a park that is appreciated by so many people," said Ole Breum, the recreation area manager, former legislator and Sargent County Water Management Board member, and early promoter of the project.

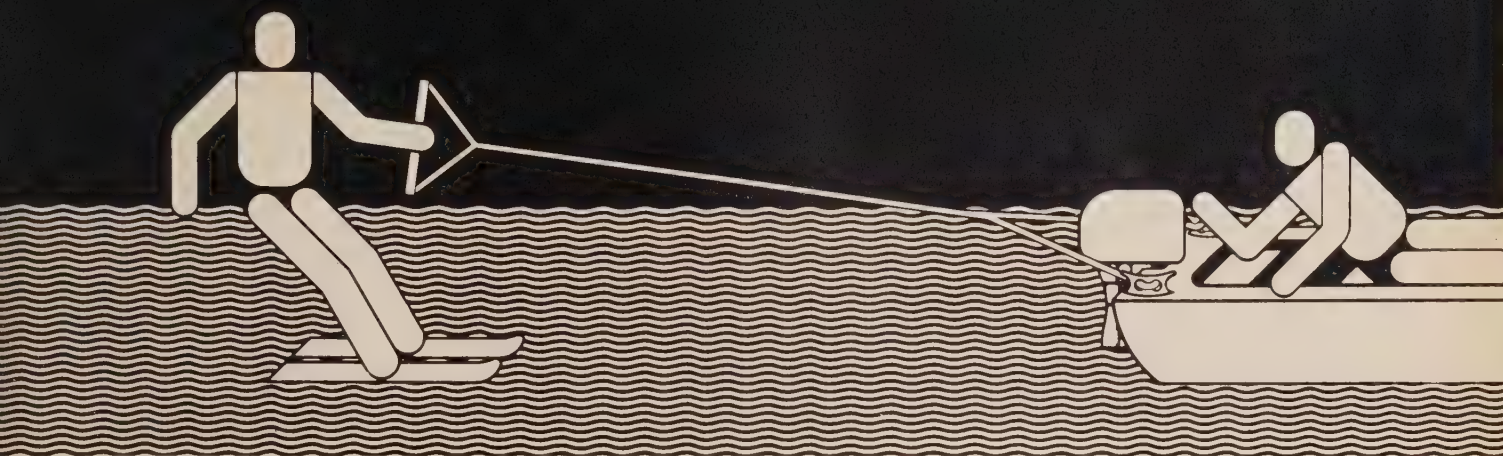
In addition to recreation facilities included in the project, local organizations and clubs wanted a reliable supply of fish to stock Silver Lake and other county lakes. The North Dakota Game and Fish Department, the Sargent County Park Board, the Sargent County Water Management Board, and the North Dakota Bureau of Outdoor Recreation helped the community plan and install the Silver Lake fish rearing pond. SCS designed the pond which is used to raise fry to fingerling size for stocking public lakes.

When filled, the fish rearing pond, which is 250 feet from the lake, covers 2.5 surface acres and holds about 2½ million gallons of water. Walleye is the principal fish reared in the pond, and in 1977, Silver Lake was stocked with 8,000 fingerlings from it.

The North Dakota Game and Fish Department assists the Sargent County Park Board in managing the pond and stocking other large county lakes.

"I wish all of our fish rearing ponds were as well kept and had the perimeter growth and natural layout of Silver Lake's pond," said Gene Van Eckout of the North Dakota Game and Fish Department.

The Tewaukon watershed project and its recreation area and the fish



rearing pond are an example of what can be achieved by people from Federal, State, and county governments working together with local organizations and individuals toward a common goal. The uses and benefits can be far reaching—all the way from North Dakota to New York.

Mr. Senechal was district conservationist, SCS, Forman, N. Dak., and is now district conservationist, SCS, Mandan, N. Dak.

Mr. Umland is public information officer, SCS, Bismarck, N. Dak.

A Dream Come True

by Martin C. Lund

For many people, the completion of a multiple-purpose watershed dam on the Upper Turtle River near Larimore, N. Dak., will be a dream come true. The structure is planned to store about 4,200 acre-feet of floodwater runoff and provide a permanent, 72-acre lake. Adjacent to the lake, a 510-acre recreation area is planned. It will include beaches for swimmers, boat docks, shelters, nature trails, and picnic areas with tables and outdoor grills. The dam will also provide a reliable source of water for the irrigation system on the Larimore golf course.

The multiple-purpose dam is part of the Upper Turtle River watershed project authorized under Public Law 566. It and the other structures in the project were designed to control

flooding of agricultural land along the river caused by snowmelt and severe summer storms.

County commissioners, water management boards, and the soil conservation districts of Nelson and Grand Forks Counties worked with the Soil Conservation Service, other USDA agencies, and the State Water Commission in planning a flood control program for the Upper Turtle River watershed. The plan calls for 26.5 miles of channel modification, 7 floodwater detention dams, 1 multiple-purpose detention dam, and 2 grade stabilization structures. In 1970, Congress authorized construction of the project.

"The watershed approach to flood control and community development is the sound way to go," said ElDee Cummings, former Grand Forks County Commissioner. "These dams could have saved the county many washed-out bridges in the years we experienced heavy runoff."

The multiple-purpose dam will be the seventh dam constructed on the Upper Turtle River.

Many public and private groups were involved in the promotion of the multiple-purpose facility. The Larimore Commercial Club assisted in public hearings, and the Larimore Golf Association helped develop and maintain interest in planning the dam with recreation in mind.

The Grand Forks County Management District purchased needed rights-of-way and will maintain the recreation facilities around the lake. "I have always felt that we should develop all of the watershed projects for the maximum benefit of the local

community," said Art Thornaldson, former chairperson of the Grand Forks Water Management Board. "I am sure future generations will agree with this type of planning."

The Western Grand Forks County Soil Conservation District will help develop wildlife habitat and plant windbreaks. The Grand Forks Water Management Board has set aside 25 acres of the recreation area to be used as an arboretum.

SCS planned and is supervising construction of the multiple-purpose dam. SCS also helped plan the irrigation system on the Larimore golf course, and Farmers Home Administration provided financing for it.

A private engineering firm developed the plans for the recreation facilities.

Construction of the dam and the recreation facilities began in 1977. They should be ready for public use by 1979.

"I often thought building a series of dams to hold runoff in the highlands would prevent a lot of downstream flooding," said Simon Fagstad, former member of the Grand Forks County Management Board. "I also like the idea of the recreation development on the dam site near the Larimore golf course. You see, I'm an avid golfer and will enjoy the view of the lake. It will also provide recreation for many of my friends and neighbors."

Mr. Lund was district conservationist, SCS, Grand Forks, N. Dak., and is now retired.

Beauty Among the Tupelos

A South Carolina swamp of giant cypress and tupelo trees has been preserved as a natural area for residents and tourists.

by Keith R. Cain

Not many people have ever visited deep into the heart of a low-country swamp. Few have ever walked among the towering cypress, tupelo, and natural bee trees or watched the wood ducks, redbreast sunfish, and pickerel.

Now, thanks to a community effort, all this is possible. A remnant of Pocotaligo—one of South Carolina's most famous black water swamps—has been saved and is open to the public.

The swamp forms a cool, shady canopy over Route 301 and has long been a landmark to local citizens and tourists from Maine to Miami. But because of the value of the fine timber on the land, the swamp was nearly lost.

When logging operations began several years ago in the area, local residents persuaded the Georgia-Pacific Corporation to donate 50 acres adjacent to the highway and persuaded the Bartow Shaw family to donate an additional 15 acres to be left in a natural condition as a scenic area.

Even though the swamp—which lies only a few hundred feet from downtown Manning—was preserved, local leaders wanted to do more. F. E. DuBose, Henry Rickenbaker, and D. L. Goldsmith, who represented Clarendon County on the Santee-Wateree Resource Conservation and Development (RC&D) Measure Committee, adopted the Pocotaligo Conservation Area Park as a committee objective. They asked Soil Conservation Service specialists for help in planning the park.

An SCS biologist made an inven-



The boardwalk, shown under construction, provides a scenic pathway.

tory of the vegetation and wildlife in the area. He found giant cypress trees, tupelo trees, and hollow trees that wood ducks used for nesting. In addition to wood ducks, he found raccoons, opossum, bobcats, deer, and songbirds. An SCS hydrologist gave advice on locating the proposed boardwalk so it wouldn't be washed away during flooding. Other advice included the type of material to use for the boardwalk, the amount of fill needed, and the location of the parking lots, restrooms, and picnic areas.

After the plan was developed, it was submitted to the U.S. Department of the Interior's Bureau of Outdoor Recreation (now the Heritage Conservation and Recreation Service) for approval of funding. The Bureau approved the plan and provided the

money for construction which was done by a local contractor. SCS provided additional technical assistance to the community by inspecting the construction to see that it was done according to the plan.

Today, Pocotaligo Conservation Area Park is a reality and residents and tourists can enjoy a peaceful walk through the giant trees on the 1,300-foot-long boardwalk.

"It took a lot of hard work and determination," said RC&D Coordinator Fred McLaughlin of Sumter. "The secret of the park's success was the fact that the people wanted the park enough to get involved."

Mr. Cain is district conservationist, SCS, Manning, S.C.

Feedlot Runoff Control

Simple, inexpensive systems for controlling animal waste often can be just as effective in preventing pollution as complex and costly ones.

by Orbin Brandvold

Ralph Bladow and his son Leon installed a simple but effective system that keeps their feedlot runoff from polluting the Wild Rice River in Richland County, south of Fargo, N. Dak.

In 1974, the Bladows wanted to build their feedlot where it would be protected by a windbreak planted by the farm's former owner. The ideal location, however, was only 100 feet away from the river.

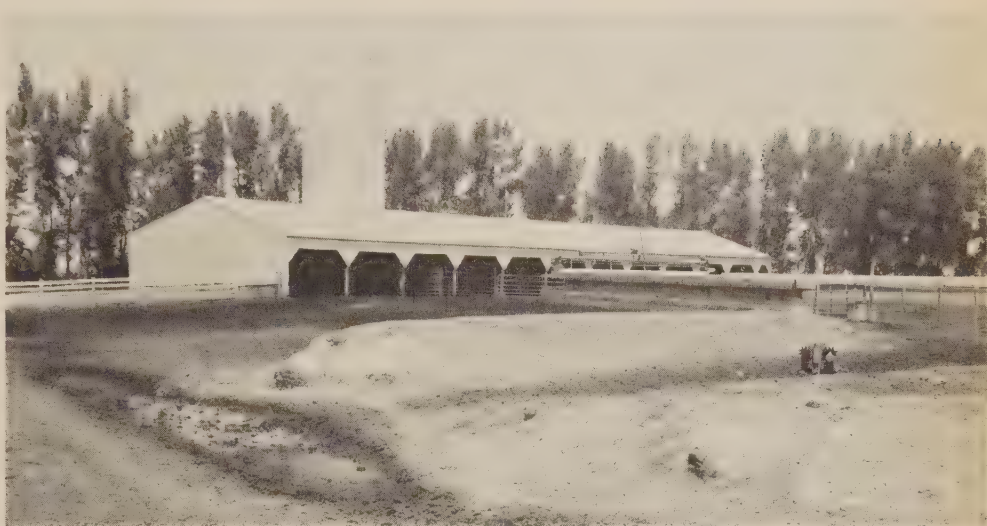
Cooperators with the Richland Soil Conservation District, the Bladows called on the Soil Conservation Service for assistance in controlling the runoff. SCS designed a 1,100-foot-long settling channel that winds around a 3-acre feedlot and empties into a holding pond. Diversion ditches and dikes contain the feedlot runoff and keep clean runoff away from polluted areas.

The State Health Department approved the project, and the Agricultural Stabilization and Conservation Service shared the \$1,500 cost through the Agricultural Conservation Program.

"The system does what it was designed to do," said Leon Bladow. "And it saves us from working in mud in the springtime. The feedlot dries out in 1 week; it would take a month to dry without the system."

Because most of the precipitation in the area falls as snow, almost all the runoff is snowmelt in the spring. It flows through the channel into the holding pond where it evaporates, leaving the pond dry by summer.

The holding pond, which has a capacity of 1 million gallons, has overflowed only once, and that was during unusually heavy rains in 1975.



With a waste management system designed by SCS, the Bladows are controlling animal waste from their feedlot and protecting a nearby river from pollution. The animal waste diversion and settling channel, in foreground, and a holding pond are the main features of the system.

Overflow is diverted through 2 miles of ditches to allow the waste to settle out before the water reaches the river.

To improve drainage and provide dry areas for the livestock, the Bladows piled mounds of earth in the feedlot. They scrape washed-in soil out of the settling channel once a year and add that material to the mounds.

Because of the good drainage, most of the manure stays by the feeder. It is scraped up and spread as fertilizer on fields of corn, soybeans, small grains, and sunflowers.

Little solid waste reaches the channel, and after 3 years of use, there is only an inch of manure on the bottom of the holding pond. At that rate, Ralph Bladow figures that

the pond will not need to be cleaned out for 20 years.

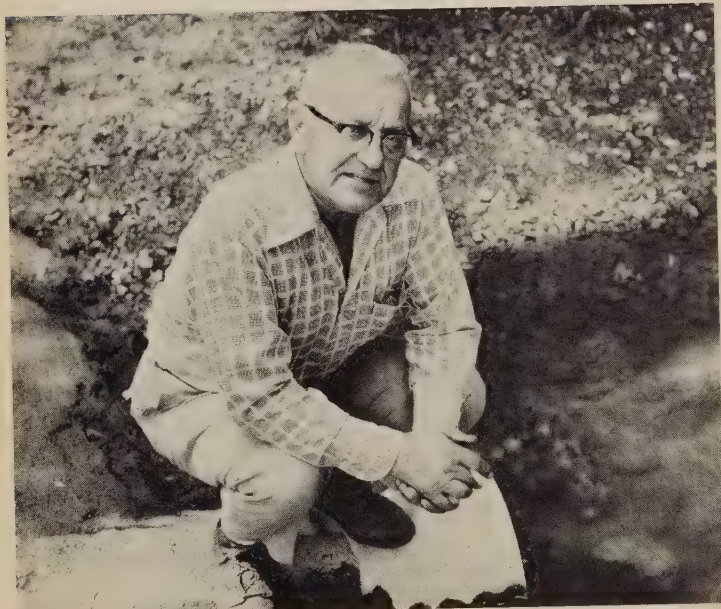
The Bladows also seeded the dikes with bromegrass and alfalfa to provide nesting cover for ducks, and they wait to cut the grass for hay until hatching is completed. Geese and pelicans as well as ducks use the holding pond in the spring.

"I like to hunt and fish," said Leon Bladow, "and if I can conserve wildlife, I'll do my part."

Mr. Brandvold is district conservationist, SCS, Wahpeton, N. Dak.

George Townsend, Dust Bowl Veteran

by Michael M. Price



George Townsend, Soil Conservation Service district conservationist at Anderson, Ind., belongs to a very distinguished group. He is one of the few employees still with SCS who worked with its parent agency, the Soil Erosion Service (SES).

Townsend started his career with SES on July 16, 1934, with training at an erosion control school in Zanesville, Ohio. SES and the Civilian Conservation Corps (CCC) had just begun working to combat erosion. There was a growing need for qualified people to provide technical assistance on demonstration and CCC camp projects.

Townsend's first appointment with SES was as a junior soil surveyor at several camps and demonstration projects. Soils information he compiled was used to determine the best land use for an area and to plan

proper treatment for erosion control.

"That was in the days of the Depression and the Dust Bowl, and we were trying to help farmers hold their soil the best way we knew how," said Townsend.

In 1935, SES was moved from the U.S. Department of the Interior and became the Soil Conservation Service of the U.S. Department of Agriculture.

The new agency continued working with the CCC, but top officials became concerned that they weren't able to reach enough people through the demonstration projects and CCC camps. "Since CCC enrollees could be transported only within about a 30-mile radius of their base camps, farms farther out often couldn't be reached," Townsend said.

President Roosevelt urged States to pass laws allowing the formation

George Townsend, SCS district conservationist at Anderson, Ind., has been with SCS since its beginning in 1935. Except for 5 years in the Army Air Force during World War II, he has devoted his career in Federal service to fighting erosion.

of conservation districts. By 1947, all States had passed such laws.

"The biggest change I've seen in SCS operations was the formation of soil conservation districts," Townsend said.

"One of the most important ways that the districts have been able to help SCS get the conservation job done is by explaining to people what we're trying to do. If land users understand, they'll be more willing to cooperate. Also, the cost-share assistance available to cooperators through the Agricultural Stabilization and Conservation Service has been very helpful."

George Townsend is now in his 44th year of service. He has worked to help land users control erosion and improve the land in six States: Ohio, Missouri, Tennessee, Illinois, Wisconsin, and Indiana.

When asked if he'd do it all over again, Townsend replied, "Yes. I like the out-of-doors; I like working for the public; and I like soil and water conservation opportunities. I had the chance to switch professions when I returned after 5 years in the Army Air Force during World War II, but I came back to SCS. I believe it is truly worthwhile work.

"My generation pioneered proper land use and appropriate treatment of soil and water resources. It's important that succeeding generations continue and expand upon the conservation work we've begun for the benefit of mankind."

Mr. Price is public information officer, SCS, Indianapolis, Ind.

Clearwater Revival

by Anne Schuhart

In the 1930's and 40's, field days held across the country demonstrated conservation practices to large numbers of farmers. One field day in Maryland impressed local residents so much that they are going to do it again.

The August morning dawned clear and hot, as usual, over Middletown Valley. But on that day 30 years ago, the rising sun was about to illuminate an event that would remain in the minds of Marylanders for decades to come.

A blast rang out, echoing back from South Mountain, and as the smoke and dust from 100 pounds of dynamite billowed into the air, 500 men and 200 machines dug into the dark brown earth of Widow Nellie Thrasher's farm. Tens of thousands cheered the workers, who would transform nearly 200 acres of gullies and wornout land into a model of conservation that day.

The Thrasher Field Day, held August 18, 1948, was sponsored by the Grange in cooperation with the Catoctin and Frederick Soil Conservation Districts (SCD's) and the Soil

Conservation Service. Its purpose was to demonstrate in 1 day the practices a farmer could install over a period of years to protect his soil and maintain productivity. Neighbors in Frederick County donated labor and equipment, and more than 40,000 people came to learn new farming techniques.

Volunteers re-formed the widow's fields to conform to the shape of the land. They tore down old fences and built new ones, all on the contour. They laid out crop strips, also on the contour, and planned a crop rotation of clover, corn, wheat, and barley.

A steep, badly eroded hillside was limed, fertilized, and reseeded for pasture. Its gullies were graded and sodded with grass to form safe waterways, and three diversions were constructed across the slope to

intercept runoff water and direct it to a prepared outlet. Men on bulldozers scooped out a pond while others laid subsurface drainage tile and opened a drainage ditch to control the water at the foot of the hill.

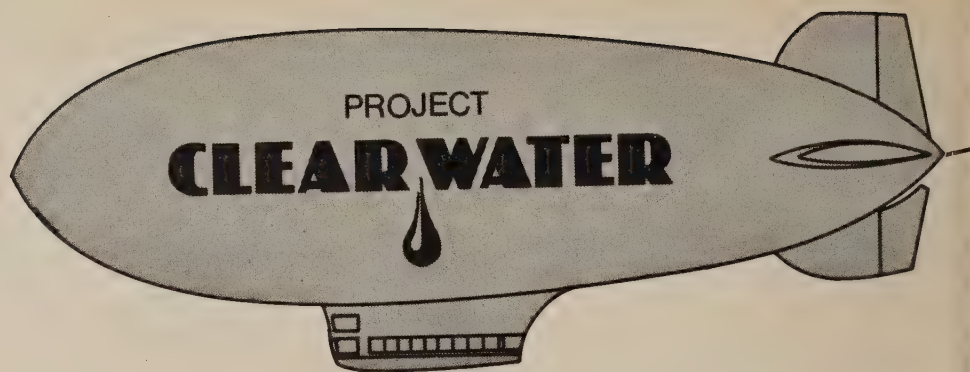
Higher up the mountain, other volunteers fenced a woodlot to keep grazing cattle out. They planted good quality seedlings and thinned out some of the poorer trees, using the lumber for the fence building and construction taking place on the farm below.

To house the extra dairy cattle the widow could feed with a higher producing farm, neighbors built a new barn and silo. They also gave the house a fresh coat of paint, planted shrubs, and improved the lane leading in from the county road.

The Thrasher Field Day was held at a time when erosion and poor

More than 40,000 people witnessed the day-long transformation of Nellie Thrasher's farm in the summer of 1948. The contour strips, diversions, and waterways installed are still working to keep water clear of sediment today.





farming practices were threatening the country's agricultural production. The event emphasized that good conservation maintains or even improves productivity.

"I can personally vouch for the fact that the conservation practices installed that day have increased productivity," declared Henry D. Lakin, Sr., chairman of the Catoclin SCD. "In 1954, I purchased that farm from Mrs. Thrasher, who was my sister. I have maintained the contour strips, waterways, diversions, and other practices the same today as they were 30 years ago.

"I can also vouch for the fact that those soil conservation practices have helped keep sediment and other pollutants out of the runoff water from the farm," Lakin continued. "If you control runoff and erosion, it automatically follows that you'll

reduce the amount of sediment, nutrients, and chemicals that get into our waterways."

Lakin bought the farm out of a sense of history: the land has been in his family since before the Revolutionary War. He maintained the conservation practices because they work and because of a sense of stewardship.

"Today's farmers have an obligation to tomorrow's generation," he explained. "If we allow erosion to occur uncontrolled, we are carving a grim destiny for our grandchildren."

Lakin said he first learned about conservation in the late 1930's. "Down the road from the Thrasher farm and across the road from my home place is the Dade farm. I remember when Morris Lee Dade was going to put in contour strip-cropping. His grandfather asked me



SCS District Conservationist Paul Edwards shows the erosion on the Roelkey farm.



On the Thrasher farm, the pond, grassed waterways, and contour strips are maintained just as they were put in at the field day 30 years ago.



Include the conservation event of the decade in your vacation plans! Project Clearwater, a colossal, old-fashioned conservation field day, will be held Saturday, August 19, in Frederick County, Md. On that day, 500 volunteers will reshape a wornout 245-acre farm into a model of soil and water conservation.

Project Clearwater, however, is not just an exercise in nostalgia—the Catoctin and Frederick Soil Conservation Districts are staging the event to show people that the Nation's clean water goals are attainable and that soil conservation helps.

Along with the serious message of the field day, there will be plenty of fun things to see and do, including hayrides, nature walks, and an antique tractor show. For overnight visitors, camping space will be available nearby.

what I thought of the idea. I said, 'Not much.' But once he got the strips in, I liked what I saw. I put in my stripcropping the next year, 1940.

"People would come by and see my strips, and the next year two or three more farmers would put in strips. Then, of course, we had the Thrasher demonstration.

"Today, this whole side of the valley is pretty well stripcropped. I don't mean to sound like I'm bragging, but all the *good* farmers stripcrop."

Farmers are likely to adopt different farming or conservation practices only after they've seen them demonstrated.

With this in mind, the Catoctin SCD will reenact the Thrasher Field Day on August 19, 1978. This time, however, the event is being called Project Clearwater. Its purpose is to

demonstrate to rural and urban people alike that soil and water conservation is vital to help clean up the Nation's streams and rivers by controlling nonpoint source pollution.

With the help of the Frederick SCD, the Catoctin SCD will completely renovate a 245-acre farm belonging to Warren Roelkey of Knoxville, Md. The Roelkey farm is located across the valley and within sight of the Thrasher farm. Two streams on the property eventually flow into the Potomac River, making the site ideal for the water quality project.

Project Clearwater will include installing contour stripcropping, relocating fences, renovating pastures, building a pond, putting in waterways and diversions, improving a stand of timber, repairing farm buildings, and installing a new

animal waste management system. Other attractions will include notable speakers, a brass band, hayrides, and maybe even an air show.

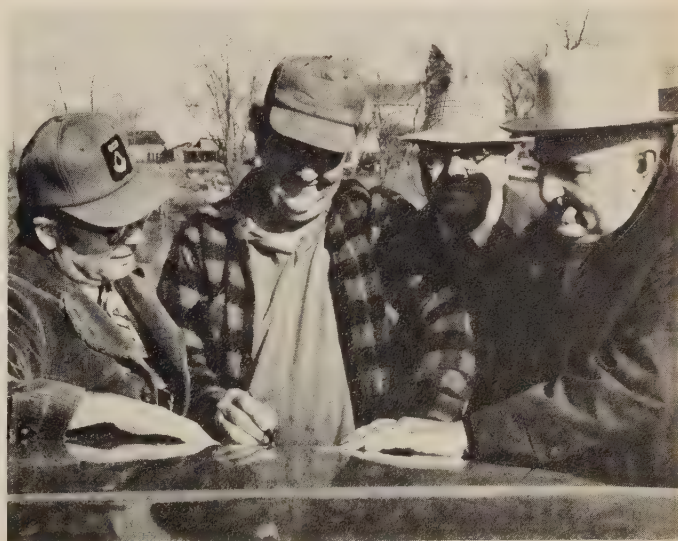
Money, equipment, materials, and labor are being donated by businesses, individuals, government agencies, and civic organizations. "Judging from the enthusiasm in the county, we expect Project Clearwater to draw 80,000 people—twice the number who attended the Thrasher event," said Lakin.

The district plans for Project Clearwater to be a conservation event that will remain in the minds of a new generation for the next 30 years—and more.

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.



The Roelkey farm (left) will be renovated under a conservation plan prepared by SCS. At right, Warren Roelkey signs his contract as a co-operator with the Catoctin Soil Conservation District. From left to right are: Paul Edwards; Roelkey; Henry D. Lakin, chairman of the Catoctin SCD; and Daniel C. Poole, chairman of the Project Clearwater steering committee.



Mahantango Means Watershed Research

by Harry B. Pionke
and Joseph D. Sieck

Hydrology research at a watershed in the Northeast provides data for determining the impact of land-use plans before they are installed.

The Mahantango Creek watershed is the major field study area of USDA's Northeast Watershed Research Center. This center is one of 10 such installations located throughout the United States. The research watersheds are part of the Watershed Research Program which originated within the Soil Conservation Service in the 1930's. The program was transferred in the 1950's to the Agricultural Research Service, which is now a part of the Science and Education Administration, Federal Research (SEA-FR).

Originally the Watershed Research Program was designed to determine the major hydrologic factors affecting runoff and erosion according to Major Land Resource Areas. This is still a major objective. The data and relationships resulting from the watershed studies have been used extensively to improve procedures and structural designs for controlling runoff and erosion.

One byproduct of the research has been long-term and diverse hydro-

logic data records. The North Appalachian Experimental Watershed at Coshocton, Ohio, for example, has been collecting hydrologic data since the 1930's. Universities and Federal agencies use the data in applied and basic research—to develop and test hydrologic models and concepts and to test hydrologic hypotheses, among other purposes.

The Mahantango Creek watershed is one of the newest research watersheds, having been operated continuously since 1966. This 161-square-mile basin of the Susquehanna River is located approximately 30 miles northeast of Harrisburg, Pa. It is the only completely operational SEA-FR research watershed in the Northeastern Region. A similar research program is being carried out on the Sleepers River watershed near St. Johnsbury, Vt. However, this program, which emphasizes snow-melt hydrology research, operates only part of the year with a skeleton gaging network.

The land use and management of

the Mahantango Creek watershed are typical of many agricultural areas located in the mountainous Northeast. The land use is 57 percent agriculture and 42 percent forest with most of the forest not managed for timber production.

The major farming activities are dairy, poultry, and livestock raising, mainly on small family farms of less than 200 acres. The objective of most cropping is to provide forage and feed for onfarm consumption by livestock. Normal fertilizer practices consist of manuring and applications of a complete fertilizer to corn or small grains in the corn-oats-hay-hay rotation. This 4-year rotation is typical, with much of the hay being alfalfa.

Generally, the farmers follow the soil and water conservation practices recommended by SCS, such as contour stripcropping with waterways and diversions, minimum tillage and no-till, terracing, grassed waterways, and winter cover crops. There is little visible evidence of erosion,

This outdoor laboratory is equipped to measure humidity, rainfall, wind speed, and evaporation rates. The data are used to determine how the amount of rainfall and its intensity affect runoff and erosion. The data is useful in designing floodwater control measures and other conservation practices.



stream eutrophication, or poor land and water management. The watershed contains some coal mining activity and a few villages, but no substantial urban areas.

The research staff that operates the Mahantango Creek Research Watershed consists of 18 scientists and supporting personnel located at the Pennsylvania State University campus, University Park, Pa., and 6 hydrologic and construction technicians with supporting personnel located on the watershed near Klingerstown, Pa. The scientists operate the watershed as an outdoor laboratory with the primary goal of solving hydrologic and associated water quality problems particular to the Northeast. Some of these problems result from surface coal mining and urbanization. The technicians operate the general data collection network, construct special experimental sites, and operate and maintain special study networks. Since 1966, they have collected climatic and hydrologic data includ-

ing rainfall, evapotranspiration, ground water, soil water, and streamflow data.

As the research program progressed and early objectives were reached, the instrumented area of the watershed was reduced from 161 to 44 square miles. The watershed includes a 3-square-mile subwatershed which is intensely instrumented and is used as a site for many special studies. In 1970, for example, water quality studies were initiated to determine the nitrogen and phosphorus content of runoff and the source of the runoff.

The research at the Mahantango Creek watershed supports the Northeast Watershed Research Center's overall goal of developing simulation capabilities that can be used to determine the hydrology-water quality impact of alternative land-use plans.

The goals of the watershed research are varied. The scientists are working on:

- Locating chemical and water source areas on an agricultural watershed.
- Simulating soil water, ground water, and associated chemical transport.
- Developing techniques for ground water recharge and peak flow reduction.
- Modeling the hydrology and chemistry of coal surface mine spoil—runoff, erosion, and acid production.

After hydrology-water quality relationships are developed on the watershed, the scientists field test them at several research satellite locations outside of the watershed. In this way, the relationships can be tested under a different set of conditions and under conditions directly related to the problem, such as at a surface mine site.



Concrete weirs measure water flow in the research watersheds. Equipment in the building to the left of this weir in the Mahantango Creek watershed measures water level. Data collected at the stream gaging sites can be used with meteorological data to estimate the amount of runoff that will accompany a certain sized rainfall.

Mr. Pionke is supervisory soil scientist, Northeast Watershed Research Center, SEA-FR, University Park, Pa.
Mr. Sieck is supervisory hydrologic technician, Northeast Watershed Research Center, SEA-FR, Klingerstown, Pa.

An SCS soil scientist spent more than 3 years in Liberia, helping several young people to prepare themselves for conducting a countrywide soil survey.

Soil Survey in Liberia



Barclayville is a typical village in eastern Liberia. The need for soil surveys is no less here than in more developed countries.

Liberian soil survey trainees set up measuring tape at a pit dug for soil examination and sampling. The training they receive will enable them to make a nationwide soil survey in Liberia.



Liberia, a tropical country on the West Coast of Africa, is pushing ahead with a national soil survey. I recently returned from a 3½-year assignment there, helping Liberians in a training program for mapping, classifying, and interpreting their country's soils.

My job was to direct a soil survey project sponsored by the U.S. Department of State, Agency for International Development (AID). The other project members and I worked with Liberian young people, giving them on-the-job training in conducting soil surveys. Our goal was to develop a professional staff capable of conducting such a survey on a national scale.

Liberia badly needs a national soil survey.

When it was settled in 1822, the land was largely a tropical forest with a rainy, superhumid climate. Now, it consists mostly of secondary growth from slash-and-burn farming practices. Upland rice is the major crop, supplemented by cassava and eddoes, potato-like root vegetables.

Liberia is trying to boost domestic rice production and reduce dependence on imported rice. It hopes to raise the income of its small farmers, who now earn only about \$60 to \$70 annually. It wants to carry out more cooperative farming projects with forest tribal people, who comprise more than 97 percent of the population.

Soil surveys can help meet all three national goals.

To increase domestic rice production, the Liberian Ministry of Agriculture concentrates on spreading the

Trainees use a soil map to locate soils suitable for growing oil palm. The site will be cleared, seedlings planted, and permanent production maintained. The forest in the background is being burned before planting upland rice and cassava. According to tradition, the land will be farmed for 2 years and then laid fallow for 5 to 10 years to restore fertility.



technique of paddy rice farming and on developing better agronomic methods for producing upland rice. Soil surveys help locate the best swamps for growing paddy rice.

To raise small farm income, the Ministry is looking for better ways to help farmers who produce tree crops like cacao, coffee, oil palm, and rubber. Soil surveys contribute by pinpointing the areas best suited for growing these crops.

To help forest tribal people, the government clears several thousand acres of forest each year for cooperative farming projects. Soil surveys indicate where the most productive soils are located.

The first job assigned to our team was to make a soil survey of the 1,700-acre Central Agricultural Experiment Station at Suakoko—about 120 miles inland from the capital city of Monrovia. Our group dug about 30 pits and made dozens of auger borings.

The Soil Conservation Service National Soil Survey Laboratory in Lincoln, Nebr., analyzed samples from six of the major soils. Then, our team developed a soil survey report, modeled after reports prepared in the United States. It was published through a cooperative agreement between SCS and AID.

The survey provided an excellent demonstration of "how to do it." It illustrated for Liberian trainees the general nature of soil surveys and how these surveys can be used. It indicated the texture, color, structure, and other characteristics of soils found in Liberia. And it showed the trainees how to write survey re-

ports by actually working on one.

We also helped Liberian personnel at the experiment station's soil laboratory to select new, modern equipment and to learn how to conduct laboratory analyses.

The soil survey staff, which had little equipment at the beginning of the project, is now well-equipped with basic tools, including a library of reference books on soils and tropical agriculture.

Joseph Famolu, of the Ministry of Agriculture's Soil Division, worked with us. He holds a master of science degree in soil science from Oklahoma State University. Famolu and I traveled to neighboring Ghana and Ivory Coast to study soils and agronomy. Because the soils situation in those countries is similar to that in Liberia, we were able to use the data we obtained in making survey interpretations at the experiment station.

In addition, the team carried out several special projects. We began a general soil map of Liberia. We started a collection of soil samples to assist in correlating soils throughout the country. And we developed a national soil handbook, containing up-to-date descriptions of the soil series, laboratory analyses, and interpretive tables.

SCS soil scientists offered technical assistance during the work. Among those called upon were Westal Fuchs, assistant director of the SCS Soil Survey Operations Division, and Paul Johnson, assistant soil correlator of the SCS Technical Service Center at Lincoln, Nebr.

I returned last August to my job as soil scientist with the SCS Technical

Support Staff at Temple, Tex., assured that Liberian scientists and technicians had established a solid base on which to build.

The Ministry of Agriculture's Soil Division now receives far more requests for soil surveys than the present staff can handle. When the project began in 1974, the Liberian soil survey division had only three people partially trained in making soil surveys. When the project ended, 13 people were actively engaged in making surveys and recommendations. An estimated 35 to 40 people still are needed.

Leadership, however, is not lacking. Serving with Famolu is Charles Mulbah, who earned a master's degree from the University of Tennessee, and Coker George, who received a master of science degree from the University of California at Chico and who spent 8 months in soil survey internship training with SCS in Florida. They will be joined soon by Walter Wiles who is receiving advanced training in soils at the University of Hawaii.

Mr. Geiger is a soil scientist,
SCS, Temple, Tex.

After spending 2 years in Nicaragua assisting with improving livestock production, an SCS agronomist returned 12 years later to help with a wind erosion problem.

by Gerald M. Darby

Controlling Wind Erosion in Nicaragua

In 1972, Christmas season celebrations in Nicaragua were shattered by a severe earthquake. It leveled much of the capital city of Managua, killed about 6,000 people, and left another 200,000 homeless. At the same time, the Central American Republic was in the grip of a severe drought.

These two natural calamities temporarily slowed the country's economic progress, but did not alter its long-term development.

I had the opportunity to observe Nicaragua "before and after." About 12 years ago, I served there for 2 years as a member of a U.S. Department of Agriculture and Agency for International Development team assisting the country in improving agriculture. Last year, I returned for 1 week to help assess increasing wind erosion problems and suggest solutions.

Earthquake scars are most visible in Managua's old town area. Only a few skeletons of buildings and some weedy vacant lots remain in what

was once a bustling section with some 100,000 inhabitants. Survivors of the earthquake have relocated on the outskirts of the former city or live with their village relatives. A building that formerly housed the Ministry of Agriculture has been destroyed. Hardly a stone of the U.S. Embassy building remains. The apartment building where I lived with my family during our first 3 months in Nicaragua suffered heavy damage.

But Nicaraguans are busily rebuilding their country, physically and economically.

Nicaragua depends on agricultural products like cotton, coffee, and sugarcane to provide much of its foreign exchange. World prices for these commodities fluctuate sharply, producing similar ups and downs in Nicaragua's economy. Agricultural planners there hope that an expanding livestock industry will help stabilize annual earnings.

During my first tour of duty in Nicaragua, I worked with a team of

specialists to assist in improving livestock production. We offered pasture management training to technicians of the Ministry of Agriculture, the National Bank, the Agrarian Reform Institute, and the National Development Institute of Nicaragua. The team assisted with livestock and pasture management demonstrations.

We also aided the National Research Station in collecting native legume seed and in conducting pasture fertilizer trials. The team took grasses that were doing well in one part of the country to other areas for trial and propagation.

The teamwork helped the Nicaraguan livestock industry prosper and gave a much needed lift to the country's economy. A Nicaraguan Government advertisement in the *Wall Street Journal* last January reported an increase in per capita income from \$241 in 1960 to more than \$825 in 1976.

I returned there last year in re-



At left, skeletons of buildings and weedy vacant lots are all that remain in an area of Managua where more than 100,000 people lived before the 1972 earthquake.



At right, Hugh Evans of the British Forestry Mission evaluates cultivars of eucalyptus for field windbreak use.

sponse to a Nicaraguan request for help in dealing with a worsening wind erosion problem. Wind erosion threatened commercial cotton production—a vital element in Nicaragua's international balance of payments.

Nicaraguan farmers had begun large-scale cotton production many years ago. Yields are good, largely because farmers apply good production practices that include fertilizers and pesticides. By producing continuously, however, they cause deterioration of soil aggregates and soil tilth, making the land more likely to erode when strong easterly winds blow.

From seedbed preparation in June until about a month after cotton planting in July or August, the soil remains loose. Without protection from severe gusting winds, long-term loss of soil fertility is certain.

Wind erosion also degrades air quality in some urban areas. Clouds of blowing dust often obscure visibil-

ity at airports and on highways. Mountainous dust clouds sometimes have engulfed the city of Leon and forced the closing of Las Mercedes International Airport at Managua.

Nicaraguan cotton growers rely on field windbreaks to hold the soil in place. Three rows of trees in each windbreak are 3 meters apart. Plants within each row are 2.5 meters apart.

My recommendations for controlling wind erosion included wind stripcropping, conservation tillage, and ridged seedbeds. Further research and field trials are needed to adapt these practices to Nicaraguan conditions.

Napiergrass, a tall-growing plant that would reduce ground wind speed, shows promise for stripcropping. Two rows of it could be planted with 12 to 16 rows of cotton. In another system, four rows of corn—or two rows of tall-growing sorghum—could be planted with 8 to 12 rows of cotton. Conservation tillage also would help.

Instead of using moldboard plows, disk plows, or disk harrows, farmers could prepare ridged seedbeds with listers. The resulting soil roughness would help slow the wind. When planting, seed would be pushed down into the moist soil, knocking off 3 or 4 inches from the ridge top. This technique assures an excellent stand and eliminates replanting, even in drier-than-normal times.

Decisions on these suggested techniques rest in the capable hands of Klaus Sengelmann, Minister of Agriculture.

The earthquake may have changed the physical character of Nicaragua, but not its moral fiber. Nicaraguans are intensely interested in solving their wind erosion problems.

Mr. Darby is staff agronomist, Ecological Sciences and Technology Division, SCS, Washington, D.C.



Nicaraguans prepare a site for planting a windbreak (far left). Three parallel rows of trees will be planted: eucalyptus in the middle, leadtree to windward, and cassia. Seedlings are distributed (near left) for windbreak plantings.

Stabilizing a Coal Refuse Pile

A coal company in southwestern Virginia revegetated its waste pile with a variety of woody plants, grasses, and legumes.

by Sheridan I. Dronen
and Charles S. Pendleton

Ten years ago, Don Jones, manager of preparation for Clinchfield Coal Company in Lebanon, Va., saw a slide presentation about the work the Soil Conservation Service was doing on revegetating surface mine spoil. He discovered that SCS has been working with coal companies for more than 20 years and had developed new plants through a plant materials program for revegetating spoil areas.

Jones turned to SCS for help in revegetating and stabilizing Clinchfield's waste pile which had accumulated during the 20 years that the coal company's processing plant had been in operation. The waste pile was more than 400 feet high and covered about 30 acres. It consisted mostly of limestone, shale, sandstone, and some coal fragments. The texture of the waste material varied from very fine powder to 4-inch pieces or bigger. The material was unstable and subject to erosion.

When SCS personnel first visited the waste pile in 1968, they spotted a clump of orchardgrass growing near the edge, which was an indication that plants might be able to grow on the pile. They ran a soil test to determine if the waste contained anything toxic to plants and to determine what nutrients would have to be added. They found that the waste material had a pH of 8.9 and that it was high in calcium, magnesium, and organic matter; medium in potassium; and low in phosphorus. They also noted that since the material was black, it would absorb heat which would make



Using information gained from trial plantings at plant materials centers, SCS specialists determined which plants would be most likely to successfully stabilize the Clinchfield Company's coal refuse pile in Lebanon, Va.

surface temperatures very high, especially during the summer, inhibiting seed and plant growth.

From previous experience in an adjoining county in revegetating magnesium spoils and from trial plantings conducted by the SCS plant materials centers, the SCS specialists knew of several plants which they thought would grow on the waste pile.

In the fall of 1968, they made a successful trial planting of annual brome grass and sweetclover. In the spring of 1969, they successfully established several woody plants, grasses, and legumes using a variety of fertilizer treatments. After the first growing season, they found that the best woody plants were 'Arnot' bristly locust, Japanese fleecflower,

fragrant sumac, indigobush, and European black alder. They rated the best herbaceous plants as weeping lovegrass, sericea lespedeza, and 'Kanlow' switchgrass.

In the spring of 1970, they made an additional planting at the base of a long slope. The waste material on the slope was sliding and endangering the railroad which ran below. They successfully established 'Arnot' bristly locust, staghorn sumac, smooth sumac, Russian olive, bladder senna, and Japanese fleecflower.

As a result of the successful trial plantings, SCS personnel recommended to the Clinchfield Coal Company a seeding mixture for stabilizing the entire waste pile. The company seeded the area by



C. S. Pendleton, SCS district conservationist, now retired, measured the height of sumac in 1970, 2 months after planting. By 1977, the vegetation recommended by SCS had successfully stabilized the coal refuse pile.

helicopter in the spring of 1972. The planting was very successful and the slope was stabilized.

In the spring of 1977, some of the SCS specialists revisited the site of the plantings. All of the woody plants established in the 1969 planting were doing well. The European black alder was 18 to 20 feet high and looked vigorous. The fragrant sumac was about 5 feet tall and had produced an excellent seed crop. The indigobush was well established and several volunteer plants had grown on the face of the slope. The 'Arnot' bristly locust was spreading in all directions and the 'Amur' honeysuckle was making good growth and was in full bloom. However, the Japanese fleece-flower had suffered some damage from a late spring frost.

Of the grasses and legumes that were planted, 'Kanlow' switchgrass, 'Chemung' crownvetch, Kentucky 31 tall fescue, 'Lathco' flatpea, and 'Kaw' big bluestem had established the best. The crownvetch had spread to several areas in adjacent plots, but it was impossible to determine if it had spread from the original plot or from the 1972 seeding. The sericea lespedeza was growing, but for undetermined reasons the stand was declining.

The Russian olive from the 1970 planting was in full bloom and well established. The 'Arnot' bristly locust had spread several feet outside the plot area but had suffered damage from the late spring frost. Its leaves and some of its new growth were severely frozen. The sumacs

had good survival and growth but were not contributing substantially to erosion control. There was, however, an excellent stand of tall fescue growing in all of the woody plots and there was 100 percent ground cover.

The Clinchfield Coal Company now uses a slightly modified version of the SCS seeding recommendations as standard practice in revegetating its waste piles.

Mr. Dronen is plant materials specialist, SCS, Raleigh, N.C.

Mr. Pendleton was district conservationist, SCS, Lebanon, Va., and is now retired.

Youth Camps for Conservation

by Frederick E. Bubb

More and more Pennsylvania youths have enrolled in conservation camps since the Nation's first county camp was opened there in 1956.

Thirty years ago, Pennsylvania State University and the Pennsylvania Federation of Sportsmen's Clubs initiated a statewide summer conservation camp program for young people. For the 40 high school students who attended the 1948 camp program, it was a new experience that combined conservation education and outdoor skills.

Through the years, the camp's popularity grew and with it the number of applications. So many students applied that it was impossible to accommodate all of them.

Sportsmen, parents, and conserva-

tionists throughout the State became concerned about the increasing number of students who had to be turned away from the State camp each year. One group, the Butler County Sportsmen's Council—an organization representing 15 affiliated clubs and more than 2,000 members—decided in 1956 to do something about educating Butler County youth in conservation. In July of that year, they opened the Nation's first county conservation camp.

Since the Butler County program began, about 600 young people between the ages of 15 and 17 have

enjoyed the camp experience. Eleven other Pennsylvania counties now have camps, many organized with the help of Leonard Green of the Butler County Sportsmen's Council. So far, more than 2,000 students have been enrolled in the county camps and in the still popular State camp.

The young people are usually sponsored by local businesses, civic clubs, or other community organizations. Camp leaders and instructors, many from conservation agencies and groups, are volunteers.

The local sportsmen's council and the local conservation district cooperate in developing the programs and managing the county camps. Many districts provide financial as well as staff support to their local conservation camp. State and Federal conservation agencies, including the Soil Conservation Service, provide camp staff and advice on conservation projects. The camps are held at facilities provided by the sportsmen's councils which also conduct some of the instructional programs.

"The primary goal of the camp program is to encourage youth to appreciate and understand the natural environment and life support systems," said Larry Smeltz, Monroe County Conservation Camp director. "There will be many beneficial side effects from the camp. Students will go back to their schools and start conservation clubs and many may seek careers in conservation."

Student participation is emphasized in camp programs. If the subject is stream ecology, the students

Campers receive instructions on many aspects of conservation, including how to improve and maintain water quality. Staff instructors are often supplied by SCS and local conservation districts.



Meetings:

June

4-8	National Council of State Garden Clubs, Inc., Detroit, Mich.
4-9	General Federation of Women's Clubs, Phoenix, Ariz.
11-15	Outdoor Writers Association of America, Virginia Beach, Va.
19-27	Soil Science Congress, Edmonton, Alberta, Canada
24-29	National Environmental Health Association, Snowmass, Colo.
25-28	American Plywood Association, Portland, Oreg.
25-28	National Watershed Congress, Toronto, Ontario, Canada
25-29	American Seed Trade Association, Inc., Kansas City, Mo.
25-30	American Water Works Association, Atlantic City, N.J.
26-30	Air Pollution Control Association, Houston, Tex.
27-30	American Society of Agricultural Engineers, Logan, Utah

July

8-12	National Association of Counties, Atlanta, Ga.
15-19	American Association of Nurserymen's Convention, New Orleans, La.
19-21	Izaak Walton League of America, Inc., French Lick, Ind.
23-27	National Federation of Business and Professional Women's Clubs, Inc., San Juan, Puerto Rico
30-Aug. 2	Soil Conservation Society of America, Denver, Colo.

August

6-9	American Agricultural Economics Association, Blacksburg, Va.
13-16	National Farm & Power Equipment Dealers Association, Calgary, Alberta, Canada
13-17	Conservation Education Association, Logan, Utah
13-17	National Association of County Agricultural Agents, Boise, Idaho
14-18	First International Rangeland Congress, Denver, Colo.
20-25	Natural Resource Council, Athens, Ga.
21-25	American Fisheries Society, Kingston, R.I.

construct stream improvement devices, such as wing deflectors, and test the water for various types of pollution. In woodland studies, forest ecology, and wildlife programs, students participate in timber stand improvement and wildlife habitat management. Soils, land-use planning, and agriculture conservation practices are part of soil and water conservation studies.

In addition, there is a full range of outdoor skills and special interest activities, such as canoeing, archery, trapping, fly-tying, and mountaineering.

"Evening rap sessions are an important part of each camp. At the rap sessions, the students express their opinions about the camp, share experiences and impressions, and have questions answered," said Lowell Edminster, SCS district conservationist in Stroudsburg, Pa. "The sessions also give the camp staff a chance to do some problem evaluating in a relaxed and informal atmosphere."

The success of Pennsylvania's county conservation camps is demonstrated by the efforts the participants have put into local conservation activities after leaving camp. Many return to serve as junior camp counselors. More than 40 of the Butler County participants are now either studying conservation in college or making conservation their career.

Mr. Bubb is public information officer, SCS, Harrisburg, Pa.

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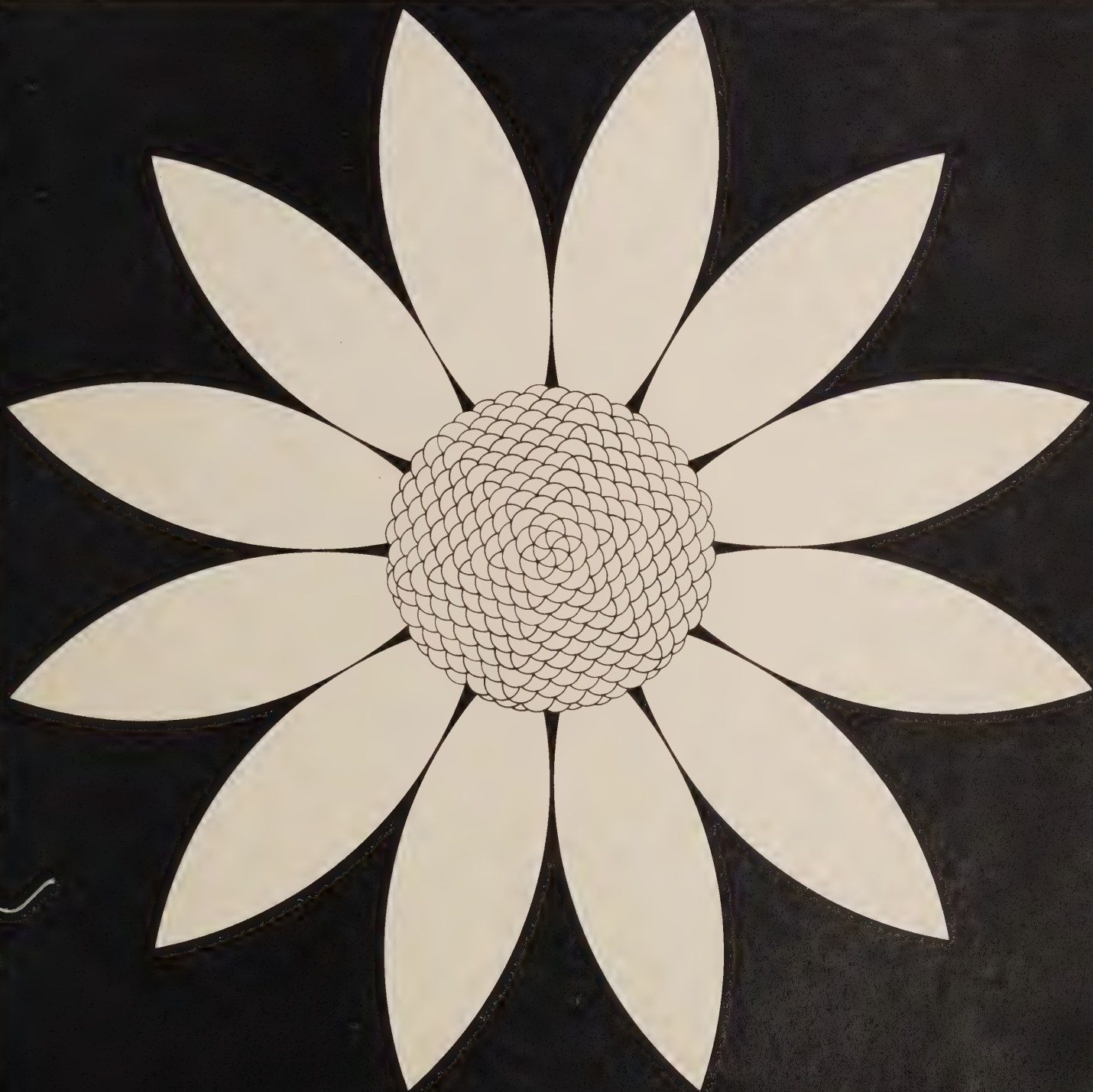
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Conservation Mushrooms

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A Greenhouse Without Glass

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1978—A Banner Year for New Conservation Plants

From the Administrator

SCS's plant materials centers are releasing a record number of conservation plants this year. In just the first 5 months of 1978, the centers released 15 varieties for commercial production, as compared to a total of 7 varieties released in 1977. By the end of the year, even more new plants will be available to help control erosion and sedimentation and to improve the quality of the environment.

The new conservation plants, released in cooperation with other Federal and State agencies, include:

- 'Alamo' switchgrass to control shoreline erosion and protect flood control structures.
- 'King-Red' Russian olive and 'Flame' Amur maple for shelterbelts and windbreak plantings, landscaping, and wildlife food and cover.
- Three varieties of wildflowers to reestablish prairies and to beautify and protect roadsides and recreation areas.
- 'Barranco' desertwillow for windbreaks and screens.

The new releases indicate how SCS's plant materials program is responding to the needs of the 1970's. We no longer search exclusively for conservation plants to be used on the farm, although these are still a major part of our work. Now we have broadened our scope, and we are evaluating environmental improvement plants for a wide range of uses.

For example, we have stepped up the search for plants that will help reclaim mined land, protect sand dunes and control shore erosion, stabilize construction sites and other critical areas, and beautify the landscape as they work. We are looking for plants that will help stabilize waste disposal areas, provide food and cover for wildlife, tolerate pollution and toxic soil conditions, and retard the spread of fire.

Each SCS employee and conservation district cooperator can participate in the plant materials program in several ways.

Be aware of current plant studies at the center serving your area and the type of plants that will help meet identified needs. Many of the plants eventually selected for release originally were sent in by SCS field employees in response to "wanted" circulars from the centers.

Encourage cooperators in your district to participate in performance testing of plant materials where their soils, sites, and land use conditions are representative.

Finally, encourage commercial production and recommend the use of plants released by the centers to cooperators in your district. After all, the plant materials specialists and soil conservationists spent years determining that these varieties are indeed the best for their specific conservation uses.

Mel Davis

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Bob Bergland
Secretary of Agriculture

R. M. Davis, Administrator
Soil Conservation Service

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Among the many new conservation plants released this year are two strains of Maximilian sunflower (see pages 4 and 5).

Soil Conservation

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Here Come the Sunflowers

Two strains of Maximilian sunflower recently joined the ranks of conservation plants released by SCS.

by Barbara L. Maus
and Dale D. Allen



Sunflowers bring to mind images of warm, lazy summer afternoons. But throughout Texas and parts of the Midwest, sunflowers will soon be hard at work stabilizing the soil and providing forage for livestock and wildlife.

The Soil Conservation Service released two strains of Maximilian sunflower, *Helianthus maximiliani*, to seed growers this year—'Prairie Gold' and 'Aztec'. A limited supply of seed is expected to be available to the public by fall.

Prairie Gold is especially adapted to the Midwest. Its good root structure holds the soil in place, providing natural erosion control.

When planted with other varieties of wildflowers and grasses, Prairie Gold has good potential for planting on roadsides; in rest areas, parks, gardens, and recreation areas; and for reestablishing prairies. It is also suitable for use in wildlife habitat areas.

Prairie Gold grows with other



true-prairie and mixed-prairie plants such as big bluestem, little bluestem, sideoats grama, switchgrass, prairie dropseed, and porcupinegrass. It grows from 20 to 90 inches tall and has numerous leaves and bright-yellow, round flowers. The plants bloom from late July through October.

Prairie Gold grows best in the western part of the Midwest—Nebraska, Kansas, and parts of Colorado, Wyoming, South Dakota, Iowa, Missouri, and Oklahoma.

During the last 10 years, SCS, the University of Nebraska, and the Nebraska Department of Roads cooperated in testing Prairie Gold.

Aztec Maximilian sunflower is similar to Prairie Gold in appearance and uses, but the area of adaptation is different. In the 1960's, SCS personnel in Texas, Oklahoma, Kansas, and Nebraska collected seed from native Maximilian sunflowers for evaluation at plant materials centers. Specialists looked for the

most widely adapted and most productive strain.

"We had to determine how much seed to plant to get a stand, how to manage the stand for maximum seed production, and how to harvest the seed," said Wayne Everett, SCS plant materials specialist in Texas. "Developing that kind of technology is an extremely important part of our plant materials work."

Everett explained that merely collecting, evaluating, and proving the value of a new plant strain is of little value unless you can grow and harvest enough seed to make extensive field tests.

"The end product of the plant materials effort is a plentiful supply of a valuable plant that will sell at a reasonable price," Everett continued. "By developing cultivation and harvesting methods, we help commercial seed growers and livestock producers achieve that goal."

Aztec underwent extensive field testing. Beginning in 1969, plantings were made at 55 locations in Texas, 17 in Oklahoma, and 11 in Kansas. The plant proved to be adapted to most soil types for range seeding mixtures where average annual rainfall is 18 inches or more. The plant did not appear to be adapted to wet or saline soils.

Initial observation plantings at Jackson, Miss., and Americus, Ga., also indicate excellent adaptability and performance. However, further trials are needed to completely document the area of adaptation.

Maximilian sunflower is native to most of the grasslands of the

Southwest, but the plant is so relished by livestock and wildlife that it has been killed out on most rangeland. It is especially attractive to cattle, sheep, horses, goats, and deer. Birds eat the seeds readily, and the tall, dense growth provides cover for several species of wildlife. Besides being very palatable, Maximilian sunflower is also high in protein.

"Many livestock producers in Texas would like to include seed for a native plant used by livestock and wildlife in their range seeding mixtures," said Everett. "But seed for such plants simply has not been available commercially."

Aztec was released to seed growers by SCS in cooperation with the Texas Agricultural Experiment Station and the Texas Parks and Wildlife Department.

Field tests at SCS plant materials centers in Knox City, Tex., and Manhattan, Kans., indicate that Aztec and Prairie Gold are equal to, or better than, any other Maximilian sunflower collection for ease of establishment, vigor, and seed production.

With the rediscovery of wildflowers, plants like Prairie Gold and Aztec are again spreading their colorful beauty over the landscape as they did in the past.

Ms. Maus is public information specialist, SCS, Lincoln, Nebr.
Mr. Allen is public information officer, SCS, Temple, Tex.

'Aztec' Maximilian sunflower, far left, and 'Prairie Gold', right, will be hard at work in Texas and the Midwest holding the soil and beautifying the landscape.

A Plant Makes Good in the Southwest

by Larry K. Holzworth
and Jacob C. Garrison

'Corto' Australian saltbush is a drought and alkali tolerant plant. It is helping to stabilize roadbanks, ditchbanks, and minespoils in the Southwest.

The Soil Conservation Service and the Arizona Agricultural Experiment Station have announced the selection and release of 'Corto' Australian saltbush, *Atriplex semibaccata*. The release of the shrub gives the southern parts of Arizona and California a superior Australian saltbush plant to use as ground cover for controlling erosion on highway rights-of-way, construction sites, and similar disturbed areas. Corto is also well suited for landscaping around suburban homesites and buildings and for use in firebreaks.

Australian saltbush is a semi-herbaceous plant native to Australia. The shrub was introduced into California through the California Agricultural Experiment Station in the 1880's, and various strains have adapted to conditions in southern California, Arizona, and New Mexico. Several strains of the plant were tested at the SCS plant materials center (PMC) in Tucson, Ariz., and Corto was selected for its uniform growth and drought tolerance. It had the best combination of con-

servation characteristics and range of adaptation to control erosion and beautify the landscape.

Corto is a perennial plant. It is 8 to 10 inches tall and grows almost flat along the ground, spreading to a diameter of approximately 6 feet. Stems become somewhat woody, but the plant is primarily herbaceous. Leaves are numerous and gray-green. The flowers are inconspicuous, and single plants have both male and female reproductive organs but in separate flowers. Male flowers are on the end of the stems, and female flowers are in the upper leaf axils. Fruits are fleshy and turn red when mature.

Corto can be established and maintained under various site conditions. Plants provide good cover in areas that have an annual precipitation of 10 to 12 inches. On arid sites supplemental irrigation or run-in moisture from roadsides and drainageways is needed for establishing and maintaining stands. Some irrigation on all sites helps insure stand establishment. Corto

grows best at elevations below 3,500 feet. Older plants at the PMC were killed back to the crown when the temperature fell below 25° F. Young plants withstood 17° and recovered in the spring. It is probable that plants would be permanently damaged at temperatures less than 10°.

Corto is best adapted to light and medium textured soils. It is well adapted to saline-alkali sites. Tests conducted at a copper mine on mine tailings, overburden, and a mixture of tailings and overburden showed good plant vigor with pH readings of 7.8 to 8.2 and total soluble salts of 2,870 parts per million—about 6 tons of soluble salts per acre foot of soil.

Plants are short lived, but stands are reestablished from seed. Corto has approximately 246,000 seeds per pound. Seeding rates of 7 pounds per acre of pure live seed have resulted in adequate stands on critical areas. Planting in late fall or early spring provides the cool weather best for seedling establishment. Drilling the seed less than one-half inch into a firm, clean seedbed and compacting the soil around the seed results in good germination.

Breeder and foundation seed will be maintained at the PMC in Tucson. Foundation seed is available to growers through the Arizona Crop Improvement Association and natural resource conservation districts.

Mr. Holzworth is manager, Tucson Plant Materials Center, SCS, Tucson, Ariz. Mr. Garrison is plant materials specialist, SCS, Phoenix, Ariz.

'Corto' Australian saltbush stabilizes the soil and beautifies the landscape. This stand of Corto provides excellent ground cover along the city of Tucson flood control channel.



The Mark of 'Zorro'

by Kenneth Croeni
and Mark W. Testerman

'Zorro' annual fescue has a big job in California. It is holding the soil along roadsides, at mine sites, and in-between rows of crops.

'Zorro' annual fescue, *Festuca megalura*, is an annual, self-reseeding grass with a wide variety of conservation uses. Originally a range plant, Zorro can also be used for stabilizing roadsides, revegetating minespoil, and providing cover in orchards and vineyards.

Testing of the grass began in 1970 at the Soil Conservation Service plant materials center (PMC) in Lockeford, Calif. SCS and the University of California released Zorro to commercial nurseries and seed producers in early 1977.

The exact origin of Zorro annual fescue has not been determined. Plant materials specialists believe it was brought into California either by Mexican or Spanish settlers who also introduced cattle into the State.

Zorro is considered a poor range grass by ranchers. But its ability for quick establishment and adaptability to poor soil conditions make it valuable for critically disturbed areas.

Zorro annual fescue is one of the first plants to start growing when the fall rains begin. Once started, it grows quickly and establishes an extensive, fibrous root system. The grass grows in short, tight bunches and has narrow blades.

Testing along newly constructed highways showed Zorro was superior to the conventional barley and ryegrass mixture. Zorro started growing earlier, established good cover faster, and was more tolerant of shallow, low-fertility soils. In many cases Zorro grew where the barley-ryegrass mixture failed. An added benefit of Zorro is the rich golden

color of the grass in spring, which provides a pleasing background for colorful wildflowers.

Since Zorro performed so well on the poor highway soils, the PMC staff decided to test it for use in minespoil revegetation. The grass was tested at the Owens-Illinois mining operation near Lone, Calif. The company mines sand and gravel for manufacturing glass, and soils at the mine were heavy textured and acidic. Eleven grasses and legumes were planted on the minespoil, but only Zorro survived.

Zorro also shows promise as a cover crop. It has proved useful in almond orchards and vineyards. Like all cover crops, it provides erosion protection and reduces soil compaction. Since it is an annual, it can be worked under in late spring to reduce interference with irrigation and harvesting operations. Further testing is needed to determine the extent of its application for cover crops.

The range of Zorro annual fescue extends throughout California's

central and coastal valleys and into the foothills. Testing is currently being conducted to see if Zorro is also adapted to conditions in southern California. The lower limits of rainfall tolerance have not been determined yet but could prove to be the limiting factor.

Foundation seed is maintained at the PMC and is made available to certified seed producers through the California Crop Improvement Association. Seed growers in resource conservation districts can also obtain seed through the district's seed increase program.

Mr. Croeni is manager, Lockeford Plant Materials Center, SCS, Lockeford, Calif.

Mr. Testerman was soil conservationist, Lockeford Plant Materials Center, SCS, Lockeford, Calif., and is now manager, Big Flats Plant Materials Center, SCS, Big Flats, N.Y.

Rows of 'Zorro' annual fescue are planted in the fall at the Lockeford Plant Materials Center and harvested for foundation seed and seed for test plots.



Remember 'Alamo'

by Dale D. Allen

An SCS employee on the lookout for conservation plants found 'Alamo' switchgrass, a plant to control shoreline erosion, protect flood control structures, and provide forage for livestock.

In Texas, 'Alamo' switchgrass, *Panicum virgatum*, is the latest grass variety released by the Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station.

The newly named variety is native to the central and southern parts of the State. It is a warm season bunchgrass that grows 3 to 7 feet high. In 1964, Laramie E. McEntire, now SCS district conservationist at Canadian, found the plant growing on the north bank of the Frio River near Three Rivers. Recognizing the superior growth characteristics of the robust plant, McEntire dug the plant up, transplanted it in his yard, and nurtured it.

When the plant produced seeds, McEntire sent them to the SCS plant materials center (PMC) at Knox City, Tex., where more than 1,000 different plants are grown and

evaluated each year. During the initial evaluation, the new strain showed good seedling vigor as well as excellent forage and seed production qualities. The strain appeared very promising and it was moved to an isolated block for continued growth and seed production.

Alamo switchgrass proved so well adapted to the south Texas climate that it greened up earlier than commercial strains at the PMC and produced seed 2 months later, adding up to a longer period of forage use during the year.

Other strains of switchgrass previously available from commercial sources are adapted only to the northern parts of Texas. When they were planted in central Texas or south Texas, the plants either didn't grow or died after a few years. Livestock producers in the southern

two-thirds of the State have desperately needed a dependable strain of switchgrass for use in range and pasture plantings. Alamo was selected to fill that need.

The grass has also proved to be extremely useful for preventing shoreline erosion when planted on earthen dams. It tolerates inundation and helps protect the shoreline from damage by wave action. Alamo has been easier to establish on dams than other strains of switchgrass.

The recommended rate for seeding in rows is 1 to 2 pounds per acre. In the spring of 1978, seed growers planted more than 900 pounds of foundation seed.

Mr. Allen is public information officer, SCS, Temple, Tex.



'Alamo' switchgrass has proved to be a good range and pasture plant and protects shorelines and earthen dams from erosion.

Bountiful Roses on the Contour

by Nadine E. Pitts

At a nursery in Pennsylvania, planting roses on the contour and other conservation practices are protecting the soil and helping to insure a bountiful harvest.

From July through September motorists on U.S. Route 1 near West Grove, Pa., can see large fields of roses like a magnificent public garden along the highway. The fields are part of an unusual farm where the crop is roses grown on the contour.

Following the contour of the land is the answer to protecting the nursery's fertile soil against erosion, an ever-present threat in the historic, rolling countryside in the southeastern part of the State.

Conard-Pyle Company, owners of the Star Roses nursery, first sought help from the Chester County Conservation District and the Soil Conservation Service 18 years ago. The SCS district conservationist assisted the company in developing a conservation plan that incorporated a combination of practices to protect the nursery's 464 acres that

range from 3 to 15 percent slopes from erosion.

To lay out contour strips on two fields totaling 92 acres, the nursery needed to do some land forming to obtain more uniform slopes and grades. Fill slopes were graded to a 3:1 slope or better in the area around the offices and buildings, and critical area plantings were established to stabilize the area.

Following a revision in the Star Roses conservation plan 3 years ago, additional conservation practices were adopted to combat erosion, including 1½ acres of grassed waterways seeded with tall fescue or creeping red fescue. The acreage in contour strips was more than doubled, to a total of 204 acres. Roses are rotated with orchardgrass and oats every 6 years. In one 35-acre field, crop residues are left on or near the surface during

critical erosion periods.

"Other nurseries in the county are applying the same practices because they work so well in keeping the topsoil in place," said Elbert Wells, SCS district conservationist.

Cooperator R. J. Hutton, the major owner, and R. Vanderbilt, the nursery operator, feel a special need to insure the land's continued use for rose culture. In 1928, the nursery acquired a tract of land at West Grove that had been part of the original grant from Charles II, King of England, to William Penn. When the parcel of land was deeded to Penn's grandson in 1731, the deed provided for the payment of a red rose yearly in lieu of rent. Two later deeds carried the same provision.

Forty years ago, the nursery resumed the symbolic payment of rent to the descendants of William Penn. Each year the first Saturday after Labor Day is Red Rose Rent Day, the occasion for ceremonies that draw growers and lovers of roses from all over the United States and other countries. At the 1977 ceremony, Henry Marc Cathey, chief, Ornamentals Laboratory, U.S. Department of Agriculture, and president of the American Horticultural Society, was the featured speaker.

In a nursery field, a home garden, or a city plot, growing roses on the contour in combination with other conservation practices enhances the environment and saves the soil.



Elbert Wells, SCS district conservationist, reviews the conservation plan for the Star Roses nursery. Growing roses on the contour is one practice that is helping protect the soil.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.

Conservation Show and Tell

by Lynn Betts

It doesn't always take a new idea to boost conservation programs. Sometimes polishing an old idea and following through on it works just as well.

Soil Conservation Service personnel in Iowa found that out last year when they put a book together to help "sell" conservation.

"A book of pictures is not a new idea—we've seen copies of books made up in the 1940's to explain conservation practices," said State Conservationist William Brune. "What we needed was an attractive, professional book of color photographs that SCS field personnel could take with them on visits to landowners."

A five-member committee made up of SCS district conservationists and technicians worked on the details of

the book. "There were other books around, but before this, each office had to make its own with the materials at hand," said District Conservationist Lyle Riedinger, committee chairperson. "We wanted a clean-looking, simple book that all the field offices could use to sell conservation."

"Protecting Your Soil," Iowa's new conservation "salesbook," is helping conservationists do just that. It is in an attractive three-ringed binder and begins by explaining the organization of the soil conservation districts and SCS and how they work together. It also shows a sample conservation plan which is a part of the overall planning process.

Pages of color photos with brief captions give land users a clear idea of what conservation practices will

look like on their land and how much soil they can expect to save. For example, the two-page spread on terraces uses five photos and one diagram, and the caption reads, "Terraces cut soil losses 60 to 80 percent." The print is large and clear.

Other practices illustrated in the book are contouring, stripcropping, diversions, grassed waterways, grade stabilization structures, farm ponds, drainage, conservation tillage, pasture management, windbreaks, and wildlife plantings. SCS employees at each office are encouraged to add other good quality, local photos of conservation practices to the salesbook.

"Initial distribution of the book averaged three per field office," said Area Conservationist John Baker, "but the committee felt that each district conservationist, conservation technician, and clerk should have a copy." The State office in Des Moines backed the committee by distributing materials and instructions for assembling the salesbooks statewide.

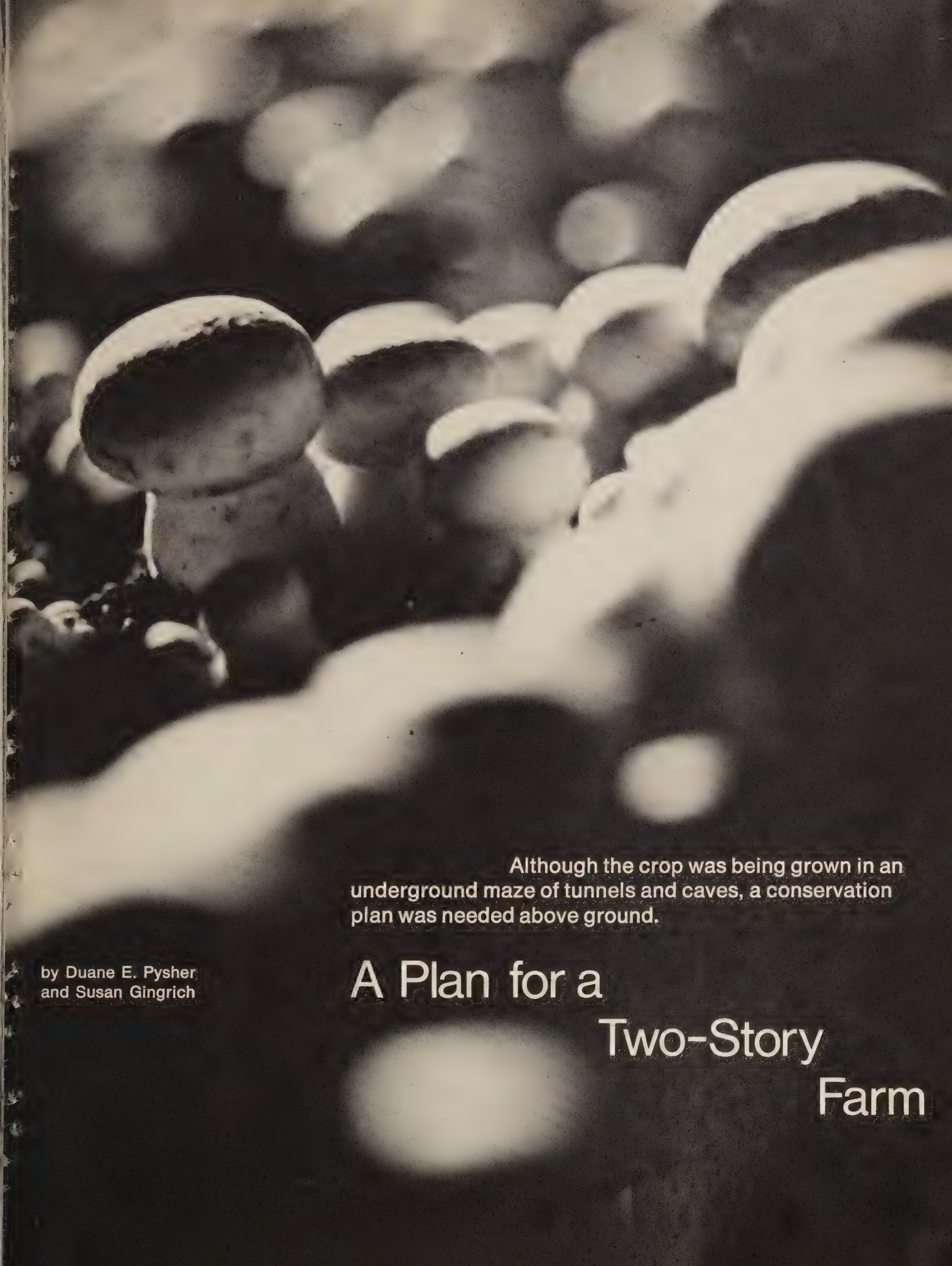
"There's a clerk in every field office ready to show the book to anyone who visits the office," said Baker.

"We know these books cost some money," Brune said, "but we look upon a professional, illustrated book of conservation practices as a needed tool for getting more conservation on the land."

Mr. Betts is public information officer, SCS, Des Moines, Iowa.



Carolyn Marshall, Kossuth County Soil Conservation District clerk, uses the conservation salesbook to show Herbert Krauss, a farmer in Fenton, Iowa, how terraces look on the land, how they are constructed, and how much soil they can save.



Although the crop was being grown in an underground maze of tunnels and caves, a conservation plan was needed above ground.

by Duane E. Pysher
and Susan Gingrich

A Plan for a Two-Story Farm

Roger Claypoole, farm manager at Worthington (left), and Duane Pysher, SCS district conservationist, examine the used organic soil after it has been applied on one of the farm's fields.



Deep under a 1,258-acre farm in Armstrong County, Pa., thrives another 800-acre farm that produces a 30 million-pound crop yearly. Electric carts carry farmers into the depths of the earth where, in the absence of rain and sunlight, the crop grows in the quiet darkness. Wearing electric miners' caps instead of straw hats, farmers go about their daily chores, regardless of the surface weather conditions.

It isn't a scene from science fiction; it's a farming operation that's going on today in western Pennsylvania. The Butler County Mushroom Farm has two operations, one in West Winfield in Butler County and one in Worthington in Armstrong County. Both operations have a conservation plan on their surface acres. But the larger farm in Worthington, described above, has a plan that covers more than 1,000 acres.

The underground mushroom farms

were started when it was discovered that the abandoned limestone mines in the Allegheny Mountains had ideal conditions for growing mushrooms—constant darkness, an unvarying temperature of 60° F, and high humidity. The West Winfield operation began in 1937, and the Worthington farm was started in 1966.

Making the compost the mushrooms are grown in requires vast amounts of mineral and organic matter. The combined production of the farms—45 million tons of mushrooms annually—takes 30,000 tons of hay and corn cobs, 94,000 tons of straw-bedded horse and chicken manure, 3,000 tons of gypsum, and 200 tons of urea. The material is blended and put into large trays where the mushrooms are spawned and grown to maturity. At the end of a 100-day crop cycle, the last mushroom is picked. The used compost is then sterilized and

spread onto open fields where it stays for 3 years.

This specialized farming operation creates special problems in land use and management above ground. Roger Claypoole, land use manager for the mushroom farm in Worthington, sought help from the Armstrong Conservation District and the Soil Conservation Service. A conservation plan was developed to help Claypoole control runoff and eliminate drainage problems on the 1,258 surface acres. His interest in conservation has led Claypoole to being appointed one of the directors of the Armstrong Conservation District.

In planning, conservationists first considered the kinds of soils on the farm and the best uses for each type of soil. For example, sites for spray irrigation using waste water and spreading the used compost were planned on well-drained soils. Where compost would be spread on

The mushroom farms have an intensive maintenance program to protect workers in the underground caves and tunnels. "Chippers" check a passageway ceiling for safety.



After spawning, each 1-ton tray of compost is covered with a layer of rich organic soil that has been recycled from used compost spread above ground for 3 years.



moderately well-drained soils, tile drainage was planned. Somewhat poorly drained soils were to be used for permanent hayland only. The plan also included grassed waterways, grassed filter strips, tile drainage, subsoiling, and no-till seeding.

Prior to spreading the used compost on the field, the soil is scarified, or subsoiled, to a depth of 16 inches to increase absorption of water into the soil profile and reduce runoff. Any runoff from the fields that does occur is directed into either grassed waterways or grassed filter strips which are seeded with reed canarygrass. Tile drains were installed to eliminate seep areas in the fields that were spread with compost. All tile outlets empty into woodlands where special limestone filter beds have been constructed to allow the discharge water to soak into the ground.

A 5-year rotation is followed on all the curing fields. The compost

stays on the field for 3 years in natural cover which protects against erosion, and then it is recycled as organic soil into the mushroom growing process. After the organic soil is removed, the field is no-till seeded to hay with small grain and timothy or orchardgrass and kept in hay seeding for 2 years. In addition to providing composting material, the hay crop takes up excess nutrients from the soil and protects it from erosion. The compost curing fields have produced outstanding hay crops without the addition of any lime or fertilizer.

The mushroom farm in Armstrong County is finding more than one use for all materials involved in cultivating mushrooms. Runoff from the composting yard is collected and stored in the holding pond. From the pond, the water is recycled into an irrigation system and onto a field of reed canarygrass which is harvested for hay. Spent

compost is used for mulch by landscapers. Some of the organic soil is reused in cultivating mushrooms, while the rest is either sold in bulk to the public or mixed with peat moss and sold as potting soil. The Pennsylvania State University Cooperative Extension Service has experimented with using the organic soil in no-till corn.

"One of the best trout streams in Pennsylvania borders the farm, and we want to keep it that way with the help of the Soil Conservation Service," said William Painter, vice president and general manager of Butler County Mushroom Farms, Inc.

Mr. Pysher is district conservationist, SCS, Kittanning, Pa.

Ms. Gingrich was a soil conservation technician, SCS, Kittanning, Pa. She is now a soil conservationist, SCS, Pittsburgh, Pa.



Butler County Mushroom Farms, Inc., employs more than 1,000 people. About two-thirds of the staff works underground. A miner's helmet and lamp are required gear.

—Photos courtesy
Butler County
Mushroom Farm, Inc.

Underground Greenhouse

Seedlings grown underground are being used in an extensive revegetation project and have a 90 percent rate of survival.

by Sharon L. Norris

The Bunker Hill Company is one of the world's largest underground lead-zinc-silver mines, located in the Coeur d'Alene mining district of northern Idaho. But something besides mining goes on 3,000 feet below ground at Bunker Hill.

In the sunless depths of an old, worked-out tunnel, thousands of pine tree seedlings are thriving in an underground greenhouse. The greenhouse is a narrow room, about 120 feet long. On wooden benches lining the sides of the room are racks and racks of seedlings. Light is supplied by several 1,000-watt halide lamps.

Almost all the necessary elements for plant life exist in the mine. The temperature is a constant 75° F, and the humidity is ideal for good growth. The exhaust ventilation tunnels contain enough carbon dioxide to support plant life, and there is no problem with insects or disease. A recently installed irrigation

system replaces the old method of hauling in water by hand.

The underground greenhouse has many advantages over the conventional type. It doesn't require heating in the winter or air conditioning in the summer. Maintenance costs are minimal since there is no glass to replace or clean. And the trees grow about 70 percent faster in the warm, humid environment.

Ed Pommerening, Bunker Hill's revegetation engineer, designed the greenhouse. Currently, 48,000 trees are produced a year at a cost of about 6 cents each. The greenhouse can ultimately be expanded to a length of 510 feet and produce two successive crops of 100,000 container trees a year. In addition to trees, Pommerening plans to begin growing shrubs in the greenhouse.

It takes about a week for the locally gathered seeds to start sprouting in their individual plastic containers that resemble very long



Far left, Ed Pommerening, revegetation engineer for Bunker Hill Company (left), and Roger Gordon, supervisor, Kootenai-Shoshone Soil Conservation District, inspect a seedling in the novel greenhouse. Near left, seedlings are ready for transplanting in about 8 months.

ice cream cones. Then the seedlings grow about an inch per month. Trees started in September are transplanted in the spring. A second crop is started in March for transplanting in the fall.

A special tool is used at planting time that makes a hole in the ground exactly the shape of the container, allowing the seedlings to be transplanted with little disturbance to their root systems.

The underground greenhouse is part of a massive program underway to revegetate the denuded hillsides and river plain of Silver Creek Valley.

The vegetative history of the valley is one filled with problems caused by nature and man. Between 1910 and 1945, a series of forest fires destroyed much of the vegetation in the valley, and sulfur dioxide emissions from the lead smelter and zinc plant damaged plant life and prevented natural regeneration

of trees and shrubs.

Today, Bunker Hill Company successfully recaptures more than 70 percent of the sulfur dioxide emissions, allowing revegetation to proceed.

Although natural reforestation has begun, the long-term revegetation program, now in its fourth year, will help. The program ultimately calls for more than 11 million trees to be planted on 18,000 acres in the Silver Creek Valley. It is jointly sponsored by the Bunker Hill Company, other area mining firms, the University of Idaho, and several Federal agencies.

The Kootenai-Shoshone Soil Conservation District was asked for advice and recommendations in the early planning stages of the revegetation program. As a result, Soil Conservation Service soil scientists conducted a special survey of the Coeur d'Alene mining district to obtain basic soils information. SCS

also made an inventory of existing vegetation in the area and recommended plant species that might be adaptable.

According to Pommerening, 90 percent of the seedlings grown in Bunker Hill's greenhouse survive the shock of transplanting, even on the poorer planting sites. Bare root species which are conventionally used by tree nurseries have an 11 percent survival rate on the same sites.

Timber and mining executives are interested in the project, and not only because it is novel. It may prove to be the most efficient and economical way yet developed for producing the millions of trees required each year for reforestation and revegetation programs.

Ms. Norris is public information officer, SCS, Boise, Idaho.



Like troops in formation, racks and racks of seedlings line the walls of the underground tunnel, waiting to reclaim the denuded hillsides and river plain of Silver Creek Valley.

Conservation Blooms on White Flower Farm

by Gordon S. Smith

A Connecticut nurseryman maintains high production of top-quality plants with the help of conservation measures.

"We can't afford *not* to use conservation measures in our nursery if we want to stay in business," commented William B. Harris who owns White Flower Farm near Litchfield, Conn.

Harris operates his 90-acre farm with a firm belief in quality. It shows in the hardy plants he sells and in the fertile soil used to propagate his stock.

In the late 1930's, after a few early years as a rancher in Colorado followed by several years of New York City living, Harris and his wife

bought an acre and a half of Connecticut land, including a 250-year-old barn.

The Harrises' rural estate life soon aroused their interest in gardening and landscaping. At first, they concentrated on improving the gardens around their remodeled barn-home. But, when they purchased two adjoining properties soon after World War II, their interest in plant materials grew.

With their added acreage and a lot of basic knowledge of plants, the Harrises decided to give up their

careers as writers and develop a top-quality nursery. At first, they considered a nursery that specialized in white flowers. The idea proved impractical, but it did lead to the name of their operation—White Flower Farm.

In researching the nursery idea, William Harris learned that many nurseries existed in this country, but few offered the new strains of perennials, such as 'Exbury' azalea, 'Symons-Jeune' phlox, or 'Blackmore' and 'Longdon' tuberous begonia. An American nursery spe-

The White Flower Farm employs 25 people year round. The number doubles during planting and harvesting.



Field Manager, Ian Waters (left), and SCS District Conservationist Arthur Cross check a diversion designed to handle excess runoff.

Harris has two large irrigation ponds that send water to most of his growing fields. SCS designed the pond in the background.

cializing in exceptionally good species of genera with quality plants true to variety might be quite successful, Harris reasoned. His research and ingenuity proved him right.

With a trip to England to see the famous Chelsea Flower Show, some visits to prominent English nurseries, and some later contacts with people at leading American nurseries, the Harrises began to develop their own nursery.

In the years that followed, the White Flower Farm grew into one of the quality nurseries of its kind in the country. Mail orders became the chief source of business. No wholesale orders were accepted and only a minimum of local buyers made purchases over the counter.

When asked why he became an avid conservationist, Harris replied, "In the early years of our nursery, excess water wasn't a real problem. That was during the dry years of the 1950's. All that changed in the early 1960's with a lot of excess water. We soon discovered that we needed some technical conservation planning help to find ways to handle the excess runoff water without eroding away our valuable soil."

In 1963, Harris became a co-operator with the Litchfield County Soil and Water Conservation District. This qualified him for technical conservation planning assistance from the Soil Conservation Service.

A firsthand look at the nursery gardens reveals numerous con-

servation measures used to protect the nursery land. A pattern of new trenches stretches across a field at the bottom of a gentle slope. Ian Waters, field manager at White Flower Farm, explains that the trenches are for a tile drainage system that is being installed in the 1½-acre field. The new tile system, designed by SCS technicians as part of the nursery's conservation plan, will have about 700 feet of tile laid a few feet under the surface to capture subsurface water and carry it out of the field.

"We've tried to grow crops on this field, but the seasonal high water table made it impossible," commented Waters. "Now, with the new tile system, we can use this field to grow nursery stock."

A diversion terrace designed by SCS was installed to carry excess rainwater from fields across a slope to a protected drainage area along the edge of nearby woods. More than 2,000 feet of these diversions have been constructed in the nursery fields, according to Waters.

Grass on the diversions is as neatly mowed as any lawn and for a good reason. Mowing keeps grass seeds from forming and invading the highly cultivated plant area near the diversions.

In the plant fields, a thick thatching of straw completely covers the soil. Waters explained that this is a mixture of sudangrass and horse manure plus a minimum of fertilizer. The mulch protects the exposed soil from erosion and enriches it.

Water from two ponds supplies an irrigation system that reaches

just about all the growing fields in the nursery. Harris had built one of the ponds several years ago and built the second in 1975 as part of the irrigation system designed by SCS. A 5-horsepower pump, plus a newer 10-horsepower pump, can provide an almost endless supply of water to the gardens above.

"This water supply has been the difference between a poor and excellent crop in recent dry summers," said Waters. "Having water available exactly when you need it is a necessity when growing prime plants."

Looking to the future, Harris cleared a 10-acre field this year. This field will go through a strict series of soil improvement steps before being put into production in about 2 years. This, Harris indicated, will bring the nursery up to his planned peak expansion and production.

"In a service business like this, where top quality is our main selling point, we have to limit our size in order to maintain quality and efficiency," said Harris. "With a few more acres in production, and a few more conservation measures to help us keep our soil and moisture in place, we'll have an ideal conservation-oriented nursery."

Mr. Smith is head, information staff, Northeast Technical Service Center, SCS, Broomall, Pa.

News Briefs

Conservation Down Under

People arriving by air at Alice Springs in central Australia are intrigued by large concentric circles on the ground that look like some kind of aboriginal art. The circles are part of a land conservation and dust

control program being carried out by the Australian Arid Zone Research Institute. Furrows, pits, or banks are dug in circles to control runoff water and allow planting of perennial grasses to hold topsoil. Rows of

trees are also used to reduce wind velocity. The work is helping in range management and in reducing dust problems around the airport and the town of Alice Springs.

—courtesy, Michael Jensen, Australian Information Service.



National Irrigation Water Study Announced

A national study on use and management of irrigation water is being conducted by the U.S. Department of Agriculture (USDA), the U.S. Department of the Interior (USDI), and the Environmental Protection Agency.

"Irrigation is by far the biggest single use of water in the United States—averaging more than 100 billion gallons daily," Secretary of Agriculture Bob Bergland said. "Finding ways to make irrigation more efficient is essential to conserve water and improve water quality."

An Interagency Task Force on Irrigation Efficiencies, based in Washington, D.C., is scheduled to complete the study report by September 1978.

Secretary Bergland said the task force will identify water use and management problems in farm irrigation systems and in irrigation water delivery systems. It also will recommend Federal actions to better coordinate irrigation assistance to farmers from USDA's Soil Conservation Service and Science and Education Administration and USDI's Bureau of Reclamation.

The study follows two recent reports on irrigation by the General

Accounting Office. The reports point out the need for detailed knowledge about potential for water conservation through irrigation improvements and about the economic, environmental, and social effects of such improvements.

An interdisciplinary Technical Work Group, with headquarters in Denver, Colo., was selected to gather and analyze field data.

The work group will solicit information and suggestions from a broad range of public interest groups and natural resource organizations, according to Secretary Bergland.

Land Treatment Effects on Water Pollution to Be Tested

The U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) announced locations in seven States where the effects of land practices on water pollution will be tested.

M. Rupert Cutler, assistant secretary of agriculture for conservation, research, and education, said most of the conservation work needed in the selected areas will begin this year and be completed within 3 years, providing a timely test of land

management practices and demonstrating their value in improving water quality.

"The information gathered from these tests will be useful in cleaning up nonpoint source water pollution," he said. Runoff from feedlots and fields carrying sediment and chemicals into rivers and streams is an example of nonpoint source pollution.

The seven areas were selected from 50 applications in 42 States for their geographic situations and types of pollution problems. Existing USDA and EPA technical, financial, and educational assistance programs will be used to accomplish water quality goals in the areas. The project sites are in central Indiana, the Maple Creek watershed area in east-central Nebraska, the Delaware River (West Branch) area in south-central New York, the Little Washita River area in south-central Oklahoma, the Broadway Lake watershed area in western South Carolina, the Lake Herman watershed area in south-central South Dakota, and the South Yakima Conservation District area in south-central Washington.



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19-21 Izaak Walton League of America, Inc., French Lick, Ind.
23-27 National Federation of Business and Professional Women's Clubs, Inc., San Juan, Puerto Rico
30-Aug. 2 Soil Conservation Society of America, Denver, Colo.

August

- 6-9 American Agricultural Economics Association, Blacksburg, Va.
13-16 Conservation Education Association, Logan, Utah
13-16 National Farm & Power Equipment Dealers Association, Calgary, Alberta, Canada
13-17 National Association of County Agricultural Agents, Boise, Idaho
14-18 First International Rangeland Congress, Denver, Colo.
21-25 American Fisheries Society, Kingston, R.I.

September

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Project **CLEARWATER**

August **19**

Mark August 19 on your calendar. That's the day for Project Clearwater, when more than 500 volunteers will reshape a worn-out 245-acre farm in Frederick County, Md., into a model of soil and water conservation.

Project Clearwater is being sponsored by the Catocin and Frederick Soil Conservation Districts to show that soil conservation also improves water quality.

